StylusScope®

MODEL 1 · AUDIO ANALYSER

Stylus wear and vinyl playback measurement instrument



FIRMWARE v9.4g · EDITION 3.1 · NOVEMBER 2026

DESIGNED AND MADE IN MANCHESTER, ENGLAND · STYLUSSCOPE.COM

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ABOUT THIS MANUAL

This manual covers the StylusScope Audio Analyser running **firmware v9.4g**, together with the StylusScope Test Record that comes with it. Your unit shows its firmware version and serial number on the start-up screen each time it is switched on. If it shows a later version than this, check stylusscope.com for the matching edition of the manual.

Read Sections 1 to 6 before you connect anything. Section 5, Quick start, is the shortest safe route to a first measurement. Sections 7 and 8 explain everyday use and what the numbers mean, and they are the part of this manual you will come back to.

CONVENTIONS USED

SHOWN AS	MEANS
BTN1, BTN2	The two push-buttons on the top panel, marked METERING and ANALYSIS.
OK, PLAY, MENU	Keys on the remote control (Section 4.6).
STYLUS WEAR	Text exactly as it appears on the StylusScope screen.
Left channel white, right channel red	The colours used for the two channels on every screen, including the graphs.

Three kinds of notice appear in this manual, each used only for what it means:

WARNING a risk of harm to you, such as hearing damage.

CAUTION a risk of damage to equipment.

NOTE useful information, with no risk attached.

SECTION 01

INTRODUCTION

1.1 WHY I BUILT STYLUSSCOPE

Thank you for choosing StylusScope. I have played records for fifty years, and for all of that time one question never had a satisfying answer: how worn is my stylus? Counting hours tells you how long it has played, not what it has become. A loupe shows you dust. The usual advice comes with a round number of hours and no evidence behind it. I got tired of guessing, so I built a way to measure.

Your cartridge is already a precision transducer. StylusScope sits between your phono stage and your amplifier, takes the same signal your amplifier receives, digitises it with a 24-bit converter and analyses it with its own FFT engine. There is no microphone, no room and no computer in the loop. It needs no soundcard, no software and no microscope.

The method is simple. **Play one track. Get a number. Compare it with the same number from when the stylus was new.**

— Pal Nagy, Paul Grand Audio, Manchester

1.2 WHAT STYLUSSCOPE DOES

	FUNCTION	WHAT IT MEASURES
F1	STYLUS ODOMETER	Playing hours, counted automatically whenever a record plays. Survives power-off.
F2	STYLUS WEAR	Stores the baseline of a new stylus, then compares each new measurement of the wear test track with it: change in output level (dB), change in distortion (percentage points) and the 3rd-to-2nd harmonic ratio. Each result is logged automatically.
F3	AZIMUTH ADJ.	Crosstalk between the channels, and the distortion balance of the two channels, from single-channel test tracks. Used to set cartridge azimuth.
F4	IMD MEASUREMENT	Intermodulation distortion: two closely spaced tones, and the difference tone the stylus adds.
F5	FREQ. RESPONSE	Level of a chosen test frequency relative to 1 kHz.
F6	FFT ANALYSER	Real-time spectrum analyser with a storable reference trace for comparison. The most revealing tool in the instrument.

Every function is enabled on your StylusScope. The small PRO tag on the F4 to F6 title screens confirms this.

1.3 WHAT STYLUSSCOPE WILL NOT DO

StylusScope will not tell you when to replace your stylus. There is no line on the screen marked "worn out", and there is no percentage of life remaining.

That is deliberate. Nobody has the data to set such a line, not me and not the cartridge makers, and a threshold invented without data would only be a guess dressed up as a measurement. What StylusScope shows you is exactly what has changed since the stylus was new, and by how much. Section 7.5 gives you the context to read those numbers, and the decision stays with you.

There is a second reason. Eighty years after the microgroove record, there is still no public dataset on how styli actually wear. Each wear check you export and share adds to the first one (Section 7.8). In time that will show what is typical for a given stylus at a given number of hours, which is the honest basis for any advice.

SECTION 02

WHAT'S IN THE BOX

Check the contents when you unpack. If anything is missing, contact support (Section 14) before you start.

- StylusScope analyser
- Infrared remote control – it needs 2 × AAA batteries, not included
- USB-A to USB-C cable, 1 m
- Stylus cleaning brush
- IR receiver cover, a small black L-shaped clip (Section 4.6)
- Quick-start guide (A5)
- StylusScope Test Record, 12-inch, 33⅓ rpm, sides A and B

> **NOTE** No mains adapter is supplied. StylusScope runs from any USB charger or USB port that provides 5 V at 500 mA or more. An RCA interconnect is not included; a 1 m stereo RCA cable can be added when you order.

Keep the packaging. It was designed and drop-tested for this instrument and its record, and it is the safest way to return the unit if it ever needs service.

SECTION 03

SAFETY

Read these points before you connect StylusScope. Further notices appear in the text, immediately before the step they apply to.

WARNING the Test Record carries continuous tones, sweeps and noise at high recorded levels. Because StylusScope stays in your system's signal path, these signals reach your loudspeakers or headphones. Turn the volume down, or mute the amplifier, before you play any test track.

CAUTION loud continuous high-frequency tones can damage tweeters. Keep the volume low whenever the Test Record is playing.

CAUTION connecting or disconnecting interconnects while the amplifier is switched on can produce loud thumps that may damage loudspeakers. Switch the amplifier off, or turn it fully down, before changing any connection.

CAUTION the RCA sockets accept the line-level output of a phono stage, up to 1 V RMS, or 3 V RMS with the built-in −10 dB attenuator switched in. Never connect a loudspeaker output or a headphone output to them.

CAUTION the USB-A socket is for a USB memory stick only. Never connect it to a computer, a charger or any other USB device that supplies power.

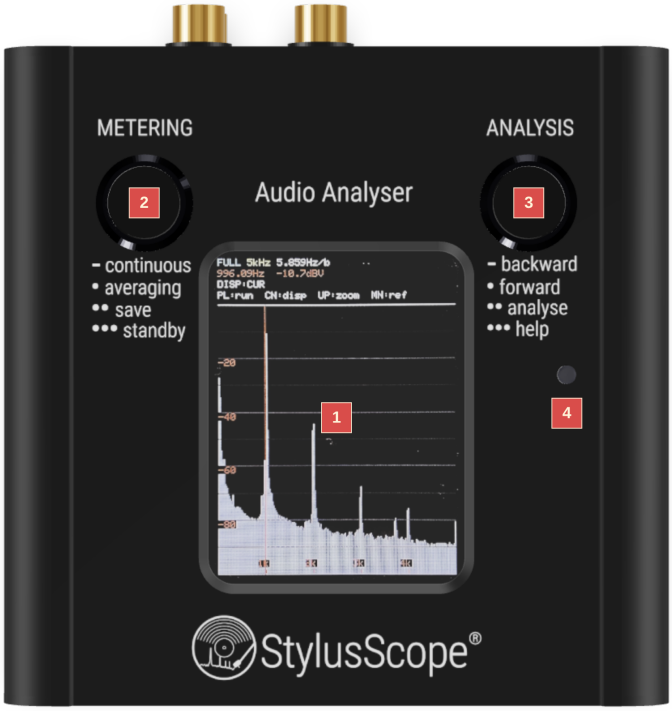
- Power StylusScope only from a 5 V USB source through the USB-C socket. There is no mains voltage inside the unit.
- Keep it away from liquids, rain and damp, and away from radiators and direct sunlight.
- There are no user-serviceable parts inside. Opening the enclosure voids the warranty.
- Do not disconnect the power while a firmware update, a data export or a log erase is in progress.

SECTION 04

GETTING TO KNOW STYLUSSCOPE

StylusScope sits flat on a shelf. The display, the two buttons and the status LED are on the top panel; the connections are on the rear panel; the infrared receiver looks out from the front face.

4.1 TOP PANEL



TOP PANEL

#	PART	WHAT IT DOES
1	Display	2.4-inch colour screen, 240 × 320 pixels. Shows measurements, function screens, settings and graphs.
2	**METERING** button (**BTN1**, left)	Measure and store: starts an averaged measurement, stores it to memory, enters standby, returns to continuous measurement.
3	**ANALYSIS** button (**BTN2**, right)	Navigate: opens the function browser, steps forward and backward through the functions, runs the selected function, opens its help page.
4	Status LED	Shows standby, odometer counting and a wear check due (Section 4.4).

The screens call the two buttons **Btn1** and **Btn2**. This manual does the same.

4.2 REAR PANEL



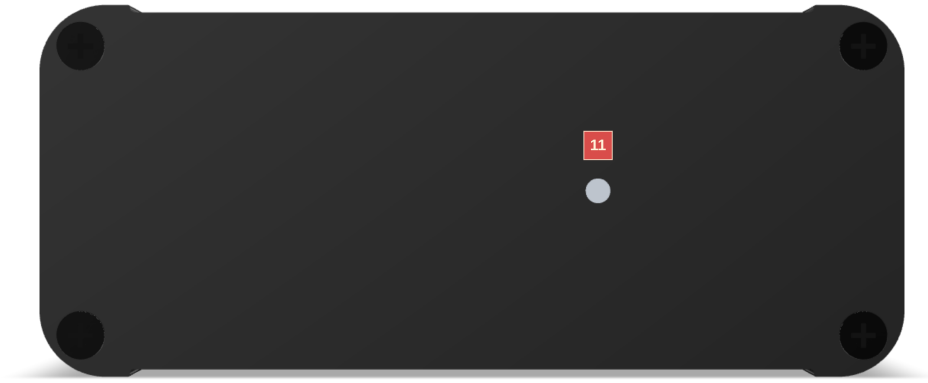
REAR PANEL

#	PART	WHAT IT DOES
5	**USB STICK** (USB-A)	For a USB memory stick only: firmware updates and export of the wear log.
6	**POWER 5V** (USB-C)	5 V DC power input.
7	**AUX I2C** (3.5 mm)	TRRS socket for future StylusScope add-on devices.
8	**INPUT** (RCA, L and R)	Signal input. Connect the output of your phono stage here.
9	**PASS-THR.** (RCA, L and R)	Through output to the next stage: preamplifier, power amplifier or active loudspeakers. Wired in parallel with INPUT, so StylusScope stays in your system permanently.
10	**INPUT ATTN.** (3 DIP switches)	The −10 dB input attenuator, for higher-output phono stages. Switch 1 tells the processor that the attenuator is in use, switch 2 attenuates the left channel and switch 3 the right channel. All three UP: 0 dB. All three DOWN: −10 dB. Always set all three the same way (Section 6.2).

> **CAUTION** connect nothing but a StylusScope add-on device to the AUX I2C socket. It is not an audio or headphone socket.

Because INPUT and PASS-THR. are connected in parallel, the music signal passes through StylusScope whether it is switched on or not. StylusScope listens to the signal; it does not process it.

4.3 FRONT FACE



FRONT FACE: 11 · INFRARED RECEIVER

The infrared receiver for the remote control sits behind the front face. Keep a clear line of sight to it.

4.4 STATUS LED

LED	MEANING
Off	Normal operation: the measuring screen or a function is on screen. The odometer is not counting.
Green	Standby. StylusScope is watching the input; no signal is present.
Blue	Standby, signal present: a record is playing and the odometer is counting. Returns to green (or orange) about 3 seconds after the signal stops.
Orange	Standby, and a wear check is due. This comes on every 50 playing hours and stays on until you run F2 STYLUS WEAR. While a record plays, blue takes priority; orange returns when the music stops.

With manual counting (Section 6.8), standby shows green only while a session is running, orange when no session runs and a wear check is due, and otherwise no light.

DURING A FIRMWARE UPDATE OR DATA EXPORT

In the USB menu the LED shows what StylusScope expects from you. The screen always says the same in words.

LED	MEANING
Yellow	Keep holding the button; or waiting for you to confirm an update.
Green	Release the button now; or the operation has finished successfully.
Blue	The USB menu is open, or StylusScope is waiting for the memory stick.
Cyan	New firmware is being written. Do not disconnect the power.
Red	The operation failed. The existing firmware is unchanged.

4.5 BUTTONS

Each button understands four gestures, and the legend printed beside each button uses the same marks: • a single short press, •• two presses in quick succession (the second within about 0.4 seconds of the first), ••• three presses, and – a hold of about one second.

GESTURE	BTN1 (METERING)	BTN2 (ANALYSIS)
• Press	**averaging**: start an averaged measurement (12 readings). Also wakes the unit from standby.	**forward**: open the function browser; then step to the next function.
•• Double-press	**save**: store the averaged reading to memory (MEM). On the F2 screen: store or replace the baseline.	**analyse**: run the selected function.
••• Triple-press	**standby**: go to standby.	**help**: open the help page of the selected function. Triple-press again to close it.
– Hold	**continuous**: return to continuous measurement; leave a function.	**backward**: step to the previous function.

> **NOTE** starting an averaged measurement and storing it to memory are done with BTN1. The remote control does not do these on the measuring screen. Inside the FFT Analyser (F6) the remote takes over completely.

HELD AT POWER-ON

Three special functions are reached by holding a button while you connect the power, and keeping it held until a message appears.

HOLD WHILE POWERING ON	MESSAGE	FUNCTION
BTN1 and BTN2 together	`RELEASE FOR NEW STYLUS`	New stylus: resets the odometer and starts a new stylus record (Section 6.6).
BTN2 alone	`KEEP HOLDING FOR USB MENU`, then `RELEASE THE BUTTON NOW`	USB menu: firmware update or export of the wear log (Sections 7.8 and 9).
BTN1 alone	`MODE CHANGED:`	Switches between Precision mode and Reference mode (Section 7.9). Keep holding for about five seconds.

4.6 REMOTE CONTROL



REMOTE CONTROL

Fit two AAA batteries (not supplied), observing the polarity marked in the battery compartment. Point the remote at the front face of StylusScope.

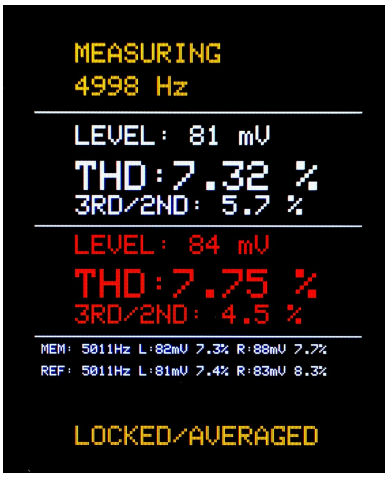
KEY	OUTSIDE THE FFT ANALYSER	INSIDE THE FFT ANALYSER (F6)
UP / DOWN	Next / previous function.	UP: frequency zoom. DOWN: slide the level window.
OK (centre of the ring)	Open the function browser; run the selected function; wake from standby. On the F2 screen with no baseline: store the baseline. Confirms on yes/no screens.	Display mode: current, reference, both.
PLAY (mute key, top right)	Same as OK. Confirms a number you have typed.	Start, average, stop.
LEFT / RIGHT	LEFT deletes the last digit while you type a number.	Move the cursor.
MENU (three lines)	Leave a function and return to the measuring screen. Cancels.	Store the reference trace.
HOME (house)	On the measuring screen: open `CDC SETUP` (Section 7.7).	Open `F6 SETTINGS`.
RETURN (arrow)	Leave a page; cancel.	Leave the settings page.
BACKSPACE	Delete the last digit.	—
0–9	Type numbers; choose items on settings pages.	Choose items on the settings page.

The red power key starts and stops a counting session when the odometer is set to manual counting (Section 6.8); otherwise it does nothing. The volume and mouse keys are not used.

OTHER REMOTE CONTROLS

The remote is not paired with one particular StylusScope: it works any StylusScope in the room, and another remote that happens to use the same codes can operate yours. If StylusScope ever reacts on its own, fit the small black L-shaped cover supplied in the box over the infrared receiver on the front face between measuring sessions, and take it off when you measure.

4.7 THE MEASURING SCREEN



MEASURING SCREEN · LOCKED/AVERAGED ON THE 5 KHZ TRACK

After start-up StylusScope shows the measuring screen. It measures the signal continuously and updates whenever the reading changes.

FIELD	MEANING
Frequency (Hz), orange, at the top	The frequency of the strongest tone at the input.
`LEVEL` (mV)	Output level of the channel, in millivolts RMS at the INPUT socket.
`THD` (%)	Total harmonic distortion: the 2nd and 3rd harmonics together, relative to the tone itself.
`3RD/2ND` (%)	The amplitude of the 3rd harmonic as a percentage of the 2nd. 100 % means they are equal. Shows `--` where it cannot be measured reliably.
Upper block (white), lower block (red)	Left channel, right channel.
`MEM:` and `REF:`	The stored memory reading and the stored baseline: frequency, level and THD of each channel, or `(empty)`.
`No baseline yet: store it in F2`	This stylus has no baseline yet. Store one from F2 once your setup is final (Section 6.4).
Status line at the bottom	`CONTINUOUS`: live readings. `AVERAGING: n/12`: an averaged measurement is in progress. `LOCKED/AVERAGED`: the averaged result is held on screen and can be stored.
`-10dB` (top right, yellow)	The input attenuator is in use.

An averaged measurement takes twelve readings and holds their average on screen. Use an averaged reading for anything you store or compare; continuous readings are for watching a signal arrive.

The frequency read-out has a useful side effect: it tells you your turntable's speed. The wear track is cut at 5000 Hz, so a reading of 5014 Hz means the platter is running 0.28 % fast.

SECTION 05

QUICK START

This is the shortest safe path from the box to a first measurement and a running odometer. Section 6 covers the same ground in detail.

> **CAUTION** switch the amplifier off, or turn it fully down, before changing any connection.

1. Connect the output of your phono stage to the **INPUT** sockets of StylusScope.
2. Connect the **PASS-THR.** sockets of StylusScope to the amplifier input your phono stage used before.
3. Check that all three **INPUT ATTN.** DIP switches are UP, in the 0 dB position.
4. Plug the USB cable into the **POWER 5V** socket and into a USB power source. The logo and the start-up screen appear, then the measuring screen.
5. Switch the amplifier back on and keep the volume low.
6. Clean the stylus with the brush supplied, from back to front.
7. Place the Test Record on the turntable, side B up, and lower the stylus onto track B1: the 1 kHz reference tone, which plays for two minutes after its announcement.
8. When the frequency on the measuring screen reads about 1000 Hz, press **BTN1**. The status line counts `AVERAGING: 1/12` to `12/12` and then shows `LOCKED/AVERAGED`.
9. Read `LEVEL` and `THD` for both channels. If either level is above 500 mV, lift the stylus, disconnect the power, set all three DIP switches DOWN (−10 dB), reconnect the power and measure B1 again.
10. Lift the stylus and return the record to its sleeve.
11. Triple-press **BTN1**. StylusScope goes to standby and the LED turns green. Play your records as usual: the LED turns blue while the odometer counts.

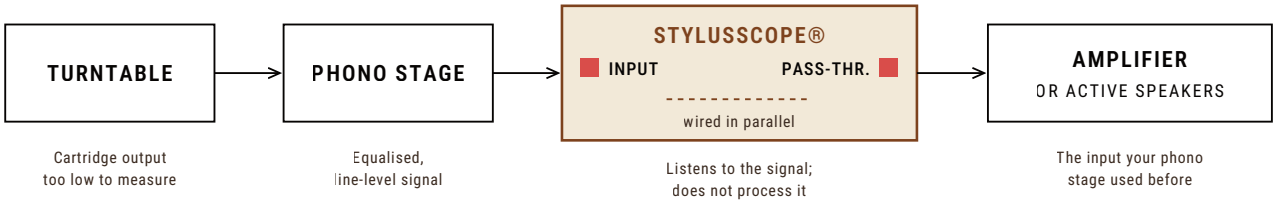
You have not stored anything yet, and that is deliberate. Take your time to learn the instrument and to finish your cartridge setup; F3 to F6 are there to help. When the setup is final, ideally within the first few playing hours of the stylus, store its baseline in F2 (Section 6.4). From then on, run a wear check whenever the LED turns orange (Section 7.2).

If your stylus is not new, read Section 6.7 first.

SECTION 06

INSTALLATION AND FIRST SETUP

6.1 WHERE STYLUSSCOPE GOES IN YOUR SYSTEM



STYLUSSCOPE SITS BETWEEN THE PHONO STAGE AND THE AMPLIFIER

StylusScope connects after the phono stage and before the amplifier. It measures the equalised line-level signal: the same signal your amplifier receives. It stays there permanently, so that the odometer can count every hour the stylus plays.

> **CAUTION** switch the amplifier off, or turn it fully down, before changing any connection.

1. Disconnect the interconnect between your phono stage and your amplifier.
2. Connect the phono stage output to the **INPUT** sockets of StylusScope. Left to left, right to right.
3. Connect the **PASS-THR.** sockets of StylusScope to the amplifier input you have just freed.

StylusScope is designed to stay permanently connected to a separate phono stage. If your phono stage is built into your preamplifier or integrated amplifier, there is usually no output that carries the turntable alone: a line, tape or record output (REC OUT) carries whichever source is selected, and at very different levels. Connect such an output to **INPUT** only for your measurements, only while the amplifier's input selector is set to phono, and leave **PASS-THR.** unconnected. Disconnect StylusScope again when you have finished. Measurements work exactly as described in this manual; for the odometer, use manual counting (Section 6.8).

> **CAUTION** many DACs and some other sources deliver 5 V or even 10 V, far above StylusScope's maximum input of 1 V RMS (3 V RMS with the attenuator). Such a level can damage the input. Never leave StylusScope connected to an output that can carry sources other than the turntable.

Do not connect the turntable directly to StylusScope. A cartridge's raw output is too low and is not equalised; StylusScope needs the output of a phono stage.

> **NOTE** the signal reaches the amplifier through a direct parallel connection, so StylusScope adds no circuitry to your music path. Its input impedance of 1 MΩ (68 kΩ with the −10 dB attenuator) appears in parallel with the amplifier input as a load on the phono stage.

6.2 INPUT LEVEL AND THE −10 dB ATTENUATOR

StylusScope accepts up to 1 V RMS, or 3 V RMS with the attenuator. For the best results, keep the level it measures below 500 mV (below 1.5 V with the attenuator). Most phono stages stay well under 500 mV on the Test Record, so the attenuator is normally left off.

CHECKING YOUR LEVEL

> **WARNING** turn the volume down before you play a test track.

1. With the measuring screen showing, play track B1 of the Test Record, the 1 kHz reference tone at 5 cm/s.
2. Press **BTN1** and wait for `LOCKED/AVERAGED`. Read `LEVEL` for both channels.
3. If either channel reads more than 500 mV, set the attenuator as described below.

SETTING THE ATTENUATOR

The attenuator setting is read once, when StylusScope starts. Change it only with the power disconnected.

1. Disconnect the USB power cable.
2. Set all three **INPUT ATTN.** DIP switches DOWN, to −10 dB.
3. Reconnect the power. The start-up screen shows `-10 dB ATT ACTIVE`, and `-10dB` appears in yellow at the top of the measuring screen.

StylusScope compensates for the attenuator, so the levels on screen remain the true levels at the input in either setting.

> **CAUTION** never set only some of the three switches. If the two channel switches and the processor switch disagree, every level reading is wrong by 10 dB.

> **NOTE** once you have stored a baseline, keep the attenuator, the phono stage gain and the cartridge loading exactly as they were for the life of that stylus. A wear check compares like with like; change the system and you are no longer measuring the stylus.

6.3 POWER AND START-UP

StylusScope takes 5 V DC through the **POWER 5V** socket: typically 200 mA, never more than 500 mA, and only 80 mA (0.4 W) in standby. Any USB charger or the USB port of a computer will do. Leave it powered permanently: the odometer counts only while StylusScope is switched on and in standby.

When you connect the power, StylusScope shows the logo for two seconds, then the start-up screen: the name, `PAUL GRAND AUDIO UK`, the serial number (`S/N`), the firmware version and `INITIALIZING...`. A few seconds later the measuring screen appears. Note your serial number; support will ask for it.

StylusScope leaves the factory with its odometer at zero, ready for the stylus you are using now.

6.4 STORING THE BASELINE

The baseline is the single most valuable measurement StylusScope will take of a stylus. Every later wear check is compared with it. Store it once your setup is final: tracking force, anti-skating, azimuth, cartridge loading, phono gain and attenuator. Store it early, ideally within the first few playing hours. A new stylus runs in over roughly its first 50 hours, so a baseline taken after a few hours loses almost nothing; what matters far more is that afterwards nothing but the stylus changes.

> **WARNING** turn the volume down before you play a test track.

1. Clean the stylus with the brush, from back to front.
2. Play side A, track 1 of the Test Record. After the announcement the 5 kHz tone plays for one minute.
3. When the frequency reads about 5000 Hz and the levels are steady, press **BTN1**. Wait for `LOCKED/AVERAGED`.
4. Double-press **BTN1**. The screen shows `STORED TO MEMORY`.
5. Press **BTN2** to open the function browser, press **BTN2** until `STYLUS WEAR` is shown, then double-press **BTN2**.
6. F2 shows `No baseline for this stylus yet.`, the stored reading and the odometer. Double-press **BTN1**, or press **OK** on the remote.
7. `STORE BASELINE?` shows the values once more. Double-press **BTN1**, or press **OK** or **PLAY**, to confirm. Anything else, or 15 seconds without input, cancels.
8. The screen shows `BASELINE SAVED`, the stylus number, the hours, and the log entry. F2 then returns, showing no change and `Already logged.`
9. Lift the stylus and triple-press **BTN1** to go to standby.

The baseline is also the first entry in the wear log for this stylus, marked as the baseline and stamped with the hours at which it was taken. From now on the F2 screen shows those hours as `Base @`.

If you have a minute, take one more wear check straight away (Section 7.2). The small difference from the baseline is the scatter of your own measurement, and it is worth knowing: a later change smaller than this is not a change at all.

> **CAUTION** after one minute, track A1 announces and plays 8 kHz and then 3 kHz. If the frequency changes from 5000 Hz before `LOCKED/AVERAGED` appears, lift the stylus, replay the track and measure again. F2 accepts only a reading of the 5 kHz tone and otherwise shows `MEM is … Hz, not the wear track.`

> **CAUTION** track A4 also ends in a 5 kHz tone, but at 0 dB, 12 dB louder. Never use it for the baseline or for wear checks. StylusScope cannot tell the two apart by frequency.

6.5 REPLACING THE BASELINE

Replace the baseline only after a deliberate change to your system other than the stylus: a different phono stage or gain setting, different loading, the attenuator switched, or the cartridge refitted. For a new stylus, use the new stylus procedure instead (Section 6.6).

1. Run a wear check as described in Section 7.2.
2. On the F2 result, or on the `LEVEL MISMATCH` screen, double-press **BTN1**. The F2 screen reminds you of this at the bottom: `Btn1 double: replace baseline`.
3. `REPLACE BASELINE?` shows the new values and the hours of the baseline it replaces. Double-press **BTN1**, or press **OK** or **PLAY**, to confirm.

The odometer, the stylus number and the wear log are all kept. The new baseline is logged and marked as a baseline, so your history shows exactly where the reference changed.

> **NOTE** replacing the baseline to make a rising distortion figure go away does not make the stylus any younger. It only hides the evidence.

6.6 FITTING A NEW STYLUS

When you fit a new stylus, tell StylusScope, so that the odometer starts again from zero. The new stylus procedure resets the odometer, gives the new stylus the next stylus number and clears the old baseline. Everything already in the wear log is kept: the history of the previous stylus is never deleted.

1. Disconnect the USB power cable.
2. Hold **BTN1** and **BTN2** together and reconnect the power. Keep holding.
3. When `RELEASE FOR NEW STYLUS` appears, release both buttons. The screen shows `NEW STYLUS`, the stylus number, `Previous wear log preserved.` and `NEXT: BASELINE`, with a reminder of how to store it.

Then set up the cartridge, and store the new baseline as in Section 6.4.

6.7 A STYLUS THAT IS NOT NEW

You can still use StylusScope with a stylus that has already played: wear is then measured from today. Store the baseline as in Section 6.4, then set the odometer to your best estimate of the hours already played (Section 7.7). StylusScope marks those hours as entered by hand, so that they are never mistaken for counted ones in the collective data.

6.8 MANUAL COUNTING

Use manual counting only when StylusScope is not permanently connected to a separate phono stage. Without a permanent connection it cannot tell when a record plays, so the odometer becomes a simple timer that you start and stop. With a separate phono stage, leave the odometer on automatic.

SWITCHING IT ON

1. On the measuring screen, press **HOME** on the remote. `CDC SETUP` opens.
2. Press **5**. The screen asks `MANUAL COUNT?`
3. Press **OK** or **PLAY** to confirm. Item 5 now reads `Manual, red key`.

Press **5** again in the same way to return to automatic counting.

COUNTING A LISTENING SESSION

Press the red power key on the remote when you start playing records. StylusScope goes to standby, the screen shows `SESSION ON` and the LED turns green: every minute now counts. Press the red key again when you have finished with records. The screen shows `SESSION OFF` and the LED goes out.

A session ends by itself after 2 hours, so a forgotten stop cannot add a whole day to the odometer. If you are still playing records after 2 hours, press the red key to start a new session. Make a habit of the red key: the odometer is only as accurate as your sessions.

LED, MANUAL COUNTING	MEANING
Off	No session: nothing is counted.
Green	Session running: the odometer is counting.
Orange	No session running, and a wear check is due.

Every wear check logged in manual mode is marked as such in the wear log, so that the collective data can tell hours timed by hand from hours counted automatically.

> **NOTE** in manual mode the remote must reach the infrared receiver, so leave the IR receiver cover off.

SECTION 07

EVERYDAY USE

7.1 STANDBY AND THE STYLUS ODOMETER

In everyday use StylusScope spends its time in standby. The screen is dark, the LED is green, and the instrument listens to the input. Whenever a record plays, the LED turns blue and the odometer counts. You do not have to do anything else.

ENTERING AND LEAVING STANDBY

- Triple-press **BTN1** to go to standby from the measuring screen.
- StylusScope also goes to standby by itself after 10 minutes without a press of **BTN1** or **BTN2**. Remote control keys do not reset this timer.
- The standby screen shows **STANDBY MODE**, **MONITORING INPUT** and the hours **ACCUMULATED**. It goes dark after five seconds; the LED stays on.
- To leave standby, press **BTN1** or **BTN2**, or **OK** on the remote.

> **NOTE** the odometer counts only in standby. While the measuring screen or a function is open, playing time is not counted. Return to standby when you have finished measuring; if you forget, StylusScope returns by itself after 10 minutes.

HOW THE HOURS ARE COUNTED

StylusScope checks the input level continuously. A minute is counted when the signal has been above 10 mV for at least half of that minute, which covers quiet passages and the gaps between tracks without counting a silent, idling system. The total is saved permanently every ten minutes and whenever you leave standby, so a power cut costs at most the last ten minutes.

Everything that plays through the phono stage counts, including the Test Record. The amplifier does not need to be on.

With manual counting (Section 6.8), the odometer counts every minute of a running session, and nothing outside one.

WEAR CHECK REMINDER

Every 50 playing hours the LED turns orange, and the F1 STYLUS ODOMETER screen shows **WEAR CHECK DUE!**. The reminder clears when you run F2 STYLUS WEAR. Nothing else changes: it is a reminder of a routine, not a judgement about the stylus.

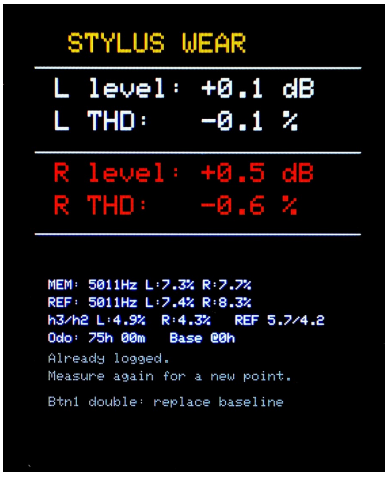
7.2 THE ROUTINE WEAR CHECK

A wear check takes about two minutes. Do one when the LED turns orange, or whenever you like. The wear log keeps one point for every ten playing hours, so checking more often than that simply updates the latest point.

1. Press **BTN1** to leave standby. The measuring screen appears.
2. Clean the stylus with the brush, from back to front.
3. Turn the volume down. Play side A, track 1 of the Test Record.
4. When the frequency reads about 5000 Hz and the levels are steady, press **BTN1**. Wait for **LOCKED/ AVERAGED**.
5. Double-press **BTN1**. The screen shows **STORED TO MEMORY**, and the **MEM:** line shows the new reading.
6. Press **BTN2** to open the function browser. StylusScope remembers the last function you used; if **STYLUS WEAR** is not shown, press **BTN2** until it is.
7. Double-press **BTN2**. The wear screen shows the result and logs it. If this stylus has no baseline yet, F2 offers to store the reading as the baseline instead (Section 6.4).
8. Lift the stylus, then triple-press **BTN1** to return to standby.

> **CAUTION** run F2 STYLUS WEAR straight after storing a wear reading. F3 AZIMUTH ADJ. and F5 FREQ. RESPONSE use the same memory (MEM), and storing a reading for them replaces a wear reading that has not yet been logged.

7.3 THE STYLUS WEAR SCREEN



F2 STYLUS WEAR · A LOGGED RESULT

LINE	MEANING
L level / **R level**	Change in output level since the baseline, in dB. Negative means the output has fallen.

LINE	MEANING
`L THD` / `R THD`	Change in distortion since the baseline, in percentage points.
`MEM:` / `REF:`	The frequency and the distortion of each channel now (MEM) and at the baseline (REF).
`h3/h2`	The 3rd-to-2nd harmonic ratio now, with the baseline value after `REF`.
`Odo:` … `Base @`	The odometer reading now, and the hours at which the baseline was taken.
`Logged entry n free x%`	The result has been written to the wear log as entry n; x % of the log is still free.
`Updated entry n`	A point already existed for this ten-hour period; it has been replaced with this one.
`Already logged.`	This stored reading was logged earlier. Take a new measurement to add a new point.
`Hours entered by hand` / `Hours partly entered by hand`	The odometer hours of this stylus were typed in, not counted (Section 7.7).
`Btn1 double: replace baseline`	A reminder that the baseline can be replaced after a deliberate system change (Section 6.5).

Distortion changes are shown in **percentage points**, not as a percentage of the old figure. If the baseline read 4.5 % and today reads 5.7 %, the screen shows `+1.2 %`.

WHEN STYLUSSCOPE CANNOT COMPARE

MESSAGE	WHAT IT MEANS AND WHAT TO DO
`No STANDARD memory!`	No reading is stored in MEM. Measure track A1 and store it first.
`MEM is … Hz, not the wear track.`	The stored reading is not from the 5 kHz wear tone. Measure side A, track 1.
`No baseline for this stylus yet.`	F2 offers to store the reading in memory as the baseline (Section 6.4).
`LEVEL MISMATCH`	The level differs from the baseline by more than 6 dB in at least one channel. No stylus loses that much output; the reading and the baseline are not the same measurement. The result is not logged. See below.

`LEVEL MISMATCH` protects your log, and the collective data, from the one error that looks valid and is not. The usual causes are playing track A4 instead of A1 (A4 is 12 dB louder), a changed phono stage gain, a changed attenuator setting, or a different cartridge. Put the system back as it was when the baseline was taken and measure again. If you changed the system on purpose, replace the baseline: the screen offers it with `Btn1 double: new baseline.` (Section 6.5).

7.4 GOOD MEASUREMENT PRACTICE

- **Clean the stylus before every wear check.** A speck of dust on the tip changes distortion more than tens, or even hundreds, of hours of wear.
- Keep the Test Record clean and in its sleeve. Play it only for measurements.
- Keep everything except the stylus the same: phono stage gain, cartridge loading, attenuator setting, tracking force and anti-skating.
- Let valve phono stages warm up for the time their maker recommends before a wear check.
- Avoid walking near the turntable while an averaged measurement runs.
- Note the conditions of your baseline: cartridge, tracking force, loading. A photograph of the setup and of the screen is quickest.

7.5 READING YOUR RESULTS

This section is the context I promised in Section 1.3. It explains what the wear figures measure, what to expect from them, and what can change them other than wear.

WHAT IS MEASURED

The wear track is a 5 kHz tone cut laterally at −12 dB. As the stylus traces it, any departure of the tip from its original shape adds harmonics to the tone. StylusScope measures the 2nd and 3rd harmonics and expresses them as a percentage of the tone: the THD figure. It also measures the output level of each channel.

StylusScope measures distortion, not the diamond. It does not see wear directly; it sees the effect of wear on the signal, which is what reaches your ears.

WHY DISTORTION, RATHER THAN LEVEL

In my own long-term test, one Audio-Technica VM95C conical stylus measured new and again at 700 playing hours, distortion on the 8 kHz vertical test band rose by 8 to 10 dB, while the output level fell by only 1.1 to 2.4 dB. The distortion moved 8 to 10 dB while the level moved about 2. That is why the wear check leads with distortion and shows level alongside it.

That is one stylus, one cartridge and one turntable: a case study, not proof. It is also why the collective data matters.

WHAT TO EXPECT ON THE WEAR TRACK

On that same conical stylus, the standard wear track read about 4.5 % THD when new and about 7.5 % at 750 hours. New elliptical and other advanced tip profiles start 25 to 50 % lower, at around 2.5 to 3.5 %. Your figures will be different. The absolute number depends on the cartridge, the tip shape, the phono stage and the turntable, so it cannot be compared between two systems. What you can compare is your own stylus with itself, over time.

More comparison figures for conical, elliptical and line-contact styli will be added to this manual and to the help pages as measurements accumulate.

THE RUN-IN: DISTORTION CAN FALL FIRST

A new stylus polishes itself in over roughly its first 50 playing hours, and its distortion typically falls by about 10 to 20 % in that time. A wear check that reads lower than the baseline in the early hours is therefore expected. It is not a fault, and it is not a mistake in your baseline.

SCATTER

No two readings are identical. Dust, the exact groove position and the record's own surface all move the result a little. Read one wear check as one point on a curve, and look for the trend over several checks. The Wear History graph (Section 7.6) is built to show exactly this.

THE 3RD-TO-2ND HARMONIC RATIO

This figure describes the make-up of the distortion: how strong the 3rd harmonic is compared with the 2nd. On the standard wear track it typically reads around 4 to 5 %. In my long-term test it hardly moved over 800 playing hours, even while THD rose quickly in the last 100 to 200 hours, so on this track it is not a wear indicator. It is there because it tells you something THD alone cannot, for example how two styli or two phono stages differ in character, and because the collected data may yet show where it does change with wear, such as on the vertical tracks.

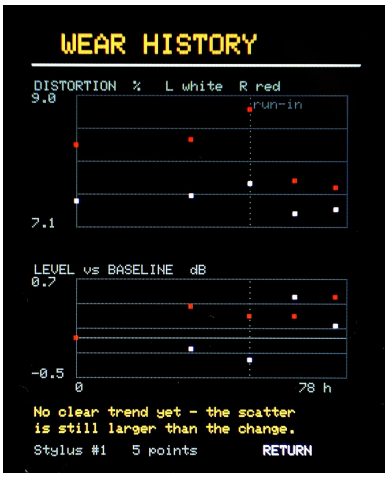
WHAT CHANGES THE READING THAT IS NOT WEAR

CAUSE	EFFECT
Dirt on the stylus	Distortion rises, sometimes sharply. Clean and measure again.
Changed tracking force or anti-skating	Distortion changes, in either direction.
Changed loading, phono gain or attenuator	Level changes; with a large change, LEVEL MISMATCH.
Worn or dirty Test Record	Distortion rises slowly, as if the stylus were wearing.
Wrong track (A4 instead of A1)	LEVEL MISMATCH.
Run-in of a new stylus	Distortion falls over the first 50 hours or so.

WHY THERE IS NO VERDICT

People ask why StylusScope does not simply say "replace it". The honest answer is that the data to say it does not yet exist, for any stylus. What you lack is not a verdict but interpretation, and StylusScope supplies that in three ways: your own curve in the Wear History graph, the reference figures in this manual, and in time the distribution of results from the collective data, of the form "half of all measurements at 500 hours fell in this band". With those in front of you, the conclusion is yours to draw, and it will be better founded than a number of hours printed on a box.

7.6 THE WEAR HISTORY GRAPH



WEAR HISTORY GRAPH

The Wear History graph plots every logged wear check of the current stylus against playing hours, starting with its baseline.

1. On the measuring screen, press **HOME** on the remote. **CDC SETUP** opens.
2. Press **4**. **WEAR HISTORY** opens.
3. Press **RETURN** to go back.

PART OF THE GRAPH	MEANING
Upper panel: **DISTORTION %**	THD of every logged check. Left channel white, right channel red.
Lower panel: **LEVEL vs BASELINE dB**	Level change from the baseline. The horizontal line is the baseline itself.
Horizontal axis	Playing hours, from 0 to the latest check.
Dotted line marked **run-in**	The 50-hour point. Checks before it fall within the run-in period.
Straight grey line (left) and dark red line (right)	The trend, fitted only to checks after the run-in. Drawn only when the evidence supports it; see below.
Trend per 100 h	The slope of the trend, in percentage points of THD per 100 playing hours.
No clear trend yet	The scatter is still larger than the change.
Stylus #n m points	The stylus number and how many checks are plotted.

I designed this graph to be honest rather than reassuring. The points are drawn exactly as they were measured, without smoothing: a moving average over a few scattered points draws a convincing trend through what may be pure noise. The trend line appears only when there are at least five checks after the run-in and the slope is at least twice its own statistical uncertainty. Until then the screen says there is no clear trend yet, which is the true answer. The vertical scales follow your data, so that a real change is visible; the figures printed on the axes keep that honest.

With fewer than two checks the page explains that a curve needs at least two. Up to 120 points are plotted; a longer history is thinned evenly, always keeping the first point.

7.7 THE CDC SETUP PAGE

CDC stands for Collective Data Collection. This page holds everything the wear log needs from you. Press **HOME** on the measuring screen to open it, press a number key to open or change an item, and press **RETURN** to leave.



CDC SETUP PAGE

KEY	ITEM	WHAT IT IS
1	SETUP ID (deck + cartridge)	A number from 1 to 255 that you choose for one turntable and cartridge combination. It is stored with every logged check.
2	ODOMETER HOURS ARE	Where the hours of the current stylus came from: Counted by meter, Entered by hand or Counted + entered.
3	SET ODOMETER BY HAND	Type in the hours, for a stylus that had already played.
4	WEAR HISTORY GRAPH	Opens the graph (Section 7.6).
5	ODOMETER COUNTING	Automatic, or Manual, red key when StylusScope is not permanently connected to a separate phono stage (Section 6.8).

The bottom of the page shows the current stylus number, how many entries the log holds out of its capacity, and the free space. EXPORT SOON appears when the log is 95 % full.

SETUP ID

Give each turntable and cartridge combination its own number and write it down: for example 1 for your main deck with its usual cartridge. Change the number when you move the StylusScope to another turntable or change the cartridge. To set it, press **1**, type the number, and press **OK** or **PLAY**.

WHERE THE HOURS COME FROM

Hours counted by StylusScope are measured; hours typed in are an estimate. Both are useful, but only if they can be told apart, so the wear log records which is which. A new stylus always starts as `Counted by meter`. After a manual entry the label changes to `Entered by hand`, or to `Counted + entered` if the odometer had already counted some hours. Pressing **2** steps through the three labels; use it only to correct a label that is wrong.

SETTING THE ODOMETER BY HAND

1. Press **3**. `SET ODOMETER` shows the current hours.
2. Type the hours with the number keys, up to 9999. **BACKSPACE** or **LEFT** deletes the last digit.
3. Press **OK** or **PLAY**. A confirmation screen shows the old and the new figure. If the new figure is lower, it warns `This WINDS THE METER BACK.`
4. Press **OK** or **PLAY** to confirm, or **RETURN** to cancel. The screen shows `ODOMETER SET` and how the hours are now marked.

`Measured hours are the good ones.` That line at the foot of the page is the whole point: keep StylusScope in the chain and in standby, and you will never need this item.

7.8 EXPORTING THE WEAR LOG

StylusScope keeps every logged check, for every stylus it has measured, until you choose to erase it. The log holds 1015 entries. To take a copy, or to share it with the collective data collection, export it to a USB memory stick.

You need a USB memory stick formatted as FAT32. Most sticks up to 32 GB are supplied formatted this way.

1. Disconnect the USB power cable.
2. Hold **BTN2** and reconnect the power. Keep holding through `KEEP HOLDING FOR USB MENU` until `RELEASE THE BUTTON NOW` appears, then release.
3. `USB MENU` appears. Press **BTN2** to move the selection to `2. Export Data`.
4. Press **BTN1** to select it. The screen shows `Insert USB stick ...`.
5. Insert the stick into the **USB-A** socket. StylusScope writes the file and shows `EXPORT OK`, the number of entries, the free space and a checksum.
6. StylusScope restarts by itself. Remove the stick.

If you take no action in the USB menu for 20 seconds, it cancels and StylusScope restarts normally. To cancel while it waits for the stick, hold **BTN1**.

The file is named `ss_wear_` followed by your serial number, for example `ss_wear_000123.csv`. It is a plain CSV file that any spreadsheet program can open. Appendix A lists its contents.

ERASING THE LOG

The log is never erased automatically, and it cannot be erased by accident. Only when it is 95 % full, and only straight after a successful export, StylusScope offers to erase it:
`LOG FULL ... Erase the on-device log to free space?` . Press **BTN2** to erase it, or hold **BTN1** to keep it.

> **CAUTION** after an erase, the file on your stick is the only copy of your wear history. Copy it to a computer before you reuse the stick.

SHARING YOUR DATA

Upload the CSV file at stylusscope.com. Each file carries the measured values, the odometer reading, whether those hours were counted or typed in, the stylus and setup numbers, and the measured tone frequency. It carries your unit's serial number, but no name, address or other personal details.

Every measurement in the collective data comes from the same pressing of the same master, read by the same kind of instrument. That is what makes them comparable, and it is something no test with a third-party record can offer.

7.9 REFERENCE MODE

Reference mode is a simplified way of running a wear check, for anyone in the household who would rather not learn the buttons. It plays no part in setting up: the baseline must first be stored in the normal Precision mode (Section 6.4).

SWITCHING MODE

1. Disconnect the USB power cable.
2. Hold **BTN1** and reconnect the power. Keep holding for about five seconds until `MODE CHANGED:` and the new mode, `REFERENCE` or `PRECISION` , appear.
3. Release **BTN1**. StylusScope remembers the mode until you change it again the same way.

RUNNING A CHECK IN REFERENCE MODE

1. Press **BTN1**. The screen shows `WAITING FOR 5 kHz SIGNAL...` .
2. Turn the volume down. Play side A, track 1.
3. StylusScope detects the tone, counts down from 3 and measures. Keep the stylus on the 5 kHz track until the result appears.
4. Read the result: the change in level and distortion for each channel since the baseline, the readings now and at the baseline, and the odometer.
5. Press **BTN1** to measure again, or triple-press **BTN1** to go to standby.

In Reference mode **BTN2** is not used. The screen shows `No reference saved!` if no baseline exists; switch to Precision mode and store one first.

> **NOTE** checks made in Reference mode are shown on screen but are not added to the wear log. To add a point to your log and to the Wear History graph, run the wear check in Precision mode (Section 7.2).

SECTION 08

THE MEASUREMENT FUNCTIONS

8.1 USING THE FUNCTION BROWSER

Press **BTN2** on the measuring screen, or **OK** on the remote, to open the function browser. Each function first shows a title screen with a short description; the footer repeats the keys that work on every page.

TO	BUTTONS	REMOTE
Step to the next function	Press **BTN2**	**UP**
Step to the previous function	Hold **BTN2**	**DOWN**
Run the selected function	Double-press **BTN2**	**OK** or **PLAY**
Open or close the help page	Triple-press **BTN2**	—
Return to the measuring screen	Hold **BTN1**	**MENU**

Each help page explains the function in brief. Where a function has two help pages, press **BTN2**, or **DOWN** on the remote, for the next page; any other button, or **MENU**, closes the help.

StylusScope remembers the function you used last and returns to it next time.

HOW F3 AND F5 USE THE MEMORY

F3 and F5 compare two measurements: one stored in memory (MEM) and the averaged reading on screen. The pattern is always the same:

1. Play the first test track. Press **BTN1** and wait for `LOCKED/AVERAGED`.
2. Double-press **BTN1** to store it in memory. The screen shows `STORED TO MEMORY`.
3. Play the second test track. Press **BTN1** and wait for `LOCKED/AVERAGED`.
4. Select the function and double-press **BTN2** to run it.

Each function screen also lists its own procedure when no reading is stored yet.

8.2 F1 STYLUS ODOMETER

Shows the total playing time of the current stylus, `TOTAL PLAYING TIME`, in hours and minutes, and the time remaining until the next wear check reminder, `Next wear check in`. When a check is due it shows `WEAR CHECK DUE!`. The count itself is described in Section 7.1.

The bottom line shows whether the odometer counts automatically or manually.



F1 STYLUS ODOMETER

8.3 F2 STYLUS WEAR

The wear check is described in full in Sections 7.2 to 7.5.

8.4 F3 AZIMUTH ADJUSTMENT

Azimuth is the sideways tilt of the cartridge, seen from the front. When it is right, the stylus sits upright in the groove and the two channels behave as a matched pair. F3 measures this in two ways, side by side, and shows both: crosstalk between the channels, and the distortion of each channel.

Test tracks: side B, track 3, which carries 1 kHz on the left channel only, then on the right channel only, both at 0 dB, followed by 10 kHz left-only and right-only at −12 dB.

> **NOTE** set tracking force and anti-skating first, by your usual method. Azimuth is the last adjustment, not the first.

MEASURING

> **WARNING** turn the volume down before you play a test track.

1. Play the left-only 1 kHz section. Press **BTN1** and wait for `LOCKED/AVERAGED`.
2. Double-press **BTN1** to store it.
3. Play the right-only 1 kHz section. Press **BTN1** and wait for `LOCKED/AVERAGED`.
4. Select `AZIMUTH ADJ.` and double-press **BTN2**.



F3 AZIMUTH ADJUSTMENT · RESULT

READING	MEANING
CROSSTALK: **L->R**, **R->L** (dB)	How much of the driven channel leaks into the other one. A higher figure means better separation.
DISTORTION: **L drv**, **R drv** (%)	The distortion of each channel on its own track.
Bal	Left-channel distortion minus right-channel distortion. Shown in green when it is within ±0.30 %, otherwise yellow.

ADJUSTING

Turn the cartridge very slightly about its long axis, following your tonearm maker's instructions, and repeat the measurement. Aim for crosstalk figures that are both as high as possible and as equal as possible, or for a distortion balance close to zero.

The two methods will not always point to exactly the same setting. The crosstalk method tells you about the generator inside the cartridge; the distortion balance compares the two channels as each one traces its own groove wall, and on real test records it is often the steadier of the two. I show both and leave the choice to you.

> **CAUTION** loosen the cartridge fixing only as far as your tonearm maker allows, and keep the stylus guard on while you adjust.

Repeat with the 10 kHz sections to see how separation behaves at high frequencies. With most cartridges it is markedly lower at 10 kHz than at 1 kHz, which is a property of the cartridge rather than of the setup.

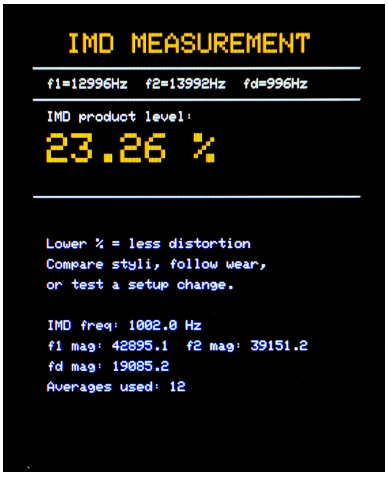
8.5 F4 IMD MEASUREMENT

Intermodulation distortion (IMD) is measured with two tones played together. A perfect stylus reproduces just the two tones; a real one also produces new tones at their difference frequency. Tracing two tones at once is a harder test of the contact between tip and groove than tracing one, and F4 measures how much of that difference tone the stylus adds.

Test tracks: side A, track 2 carries the tone pairs 1 & 1.4, 4 & 4.4, 8 & 8.4 and 13 & 14 kHz, cut laterally at −12 dB. Side A, track 3 carries 4 & 4.4 and 13 & 14 kHz as vertical cuts. Each pair plays for one minute after its announcement. The 13 & 14 kHz pair is the most demanding; it produces a 1 kHz difference tone.

> **WARNING** turn the volume down. These are loud, high-pitched tones.

1. Play the tone pair. Press **BTN1** and wait for **LOCKED/AVERAGED**.
2. Select **IMD MEASUREMENT** and double-press **BTN2**.



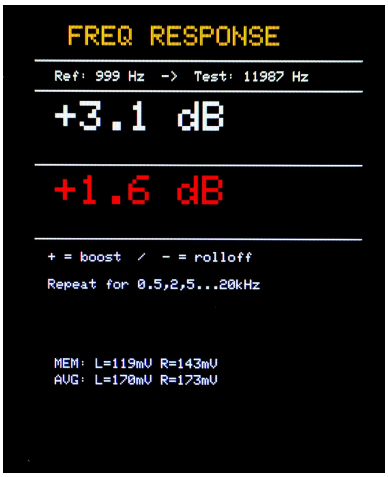
F4 IMD MEASUREMENT · 13 & 14 KHZ PAIR

The screen shows the two tone frequencies (**f1**, **f2**) and their difference (**fd**), and in large figures the IMD product level as a percentage: the amplitude of the difference tone relative to the sum of the two tone amplitudes. Lower is better. The detail lines show the exact frequency and magnitude of each component and the number of readings averaged. IMD is calculated from the left channel.

Use F4 to compare styli, to follow wear alongside F2, and to see the effect of setup changes such as tracking force. F4 results are not added to the wear log, so note them down if you want to follow them over time.

If the screen shows **Cannot find two HF peaks**, it also shows the two frequencies it did find and their level difference. Check that the right track is playing and that the measurement was taken while both tones were present.

8.6 F5 FREQUENCY RESPONSE



F5 FREQUENCY RESPONSE · RESULT

F5 measures the level of a test frequency relative to 1 kHz. The result shows how your cartridge, its loading and your phono stage's equalisation work together in your system.

Test tracks: side B, track 2. It starts with the 1 kHz reference, then steps through 100 Hz, 500 Hz, 2, 5, 10, 12, 15, 18 and 20 kHz, all at −20 dB and 30 seconds each. That is long enough to average each step as it plays.

> **CAUTION** take the 1 kHz reference from track B2, not from track B1. B1 is recorded at 0 dB, 20 dB louder than the B2 tones, and every result would be 20 dB out.

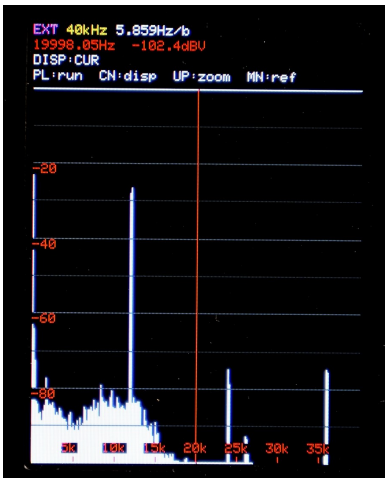
> **WARNING** turn the volume down before you play a test track.

1. Play track B2. During the first step, 1 kHz, press **BTN1** and wait for `LOCKED/AVERAGED`.
2. Double-press **BTN1** to store it as the reference.
3. When the next frequency plays, press **BTN1** and wait for `LOCKED/AVERAGED`.
4. Select `FREQ. RESPONSE` and double-press **BTN2**.
5. For each further frequency, repeat steps 3 and 4. The 1 kHz reading stays in memory, so you can also lift the stylus and return to any step later.

The screen shows the reference and test frequencies, then the level of the test frequency relative to 1 kHz for the left channel (white) and the right channel (red). A positive figure is a rise, a negative figure a fall.

For a continuous picture of the whole range, play the sweep and white noise on side B, track 4 with the FFT Analyser (Section 8.7).

8.7 F6 FFT ANALYSER



F6 FFT ANALYSER · EXTENDED RANGE

F6 is a real-time spectrum analyser. It shows the whole spectrum of the signal at once, so you can see every harmonic, every hum component and every resonance, rather than a single figure. It is the most revealing tool in the instrument.

Levels are shown in **dBV**, where 0 dB is 1 V RMS. The display covers 0 to −100 dBV.

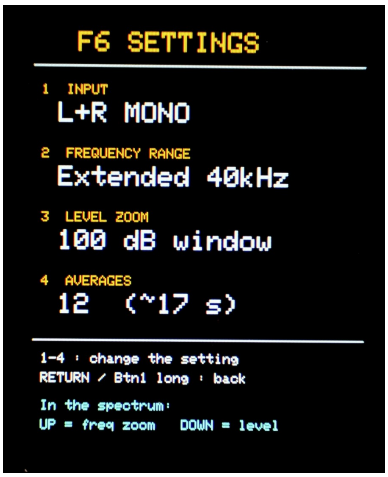
FREQUENCY RANGES

RANGE	SPAN	RESOLUTION	USE IT FOR
Full 20 kHz	20 kHz	5.859 Hz per bin	General spectrum: harmonics, noise, the overall picture.
Hi-Res 1 kHz	1 kHz span, 60 Hz window in use	0.488 Hz per bin	Tonearm and cartridge resonance, rumble, motor artefacts.
Extended 40 kHz	40 kHz	5.859 Hz per bin	Harmonics of high test tones that fall above 20 kHz.

An averaged run takes longer at higher resolution. With 12 averages it takes about 10 seconds in Full range, 16 seconds in Extended and 40 seconds in Hi-Res; the settings page shows the estimate for your choice.

THE SETTINGS PAGE

Press **HOME** inside F6 to open **F6 SETTINGS**, or triple-press **BTN2**. Press a number key to change an item. Press **RETURN**, or hold **BTN1**, to go back. Your settings are kept when StylusScope is switched off.



F6 SETTINGS PAGE

KEY	SETTING	CHOICES
1	INPUT	L+R MONO , LEFT , RIGHT , L-R VERT
2	FREQUENCY RANGE	Full 20 kHz , Hi-Res 1 kHz , Extended 40kHz
3	LEVEL ZOOM	100, 40 or 20 dB window
4	AVERAGES	12, 24 or 36, with the expected time

Changing the input or the frequency range changes what is being measured, so StylusScope discards the stored traces and starts measuring again with the new setting. Changing the level window or the number of averages only changes the view, and the traces are kept.

THE FOUR INPUTS

L+R MONO is the sum of both channels, LEFT and RIGHT are the single channels, and L-R VERT is the difference of the two channels, which isolates the vertical component of the groove.

The vertical channel is there because of a piece of groove geometry called the **pinch effect**. When a groove is cut laterally, its width varies slightly at twice the signal frequency, and this lifts and lowers the stylus as it plays. Part of the 2nd harmonic measured on a lateral track therefore comes from the groove itself, not from the stylus. On a lateral cut the mono sum cancels that vertical motion and the difference channel shows it on its own, so you can separate groove geometry from what the stylus really adds.

CONTROLS

KEY	BUTTONS	ACTION
PLAY	Press **BTN2**	Stopped: start free-running measurement. Free-running: start an averaged run. During an averaged run: stop, and hold the display.
—	Double-press **BTN2**	Start free-running in Full range at once.
OK	—	Display mode: current trace, reference trace, or both.
MENU	Double-press **BTN1**	Store the current trace as the reference.

KEY	BUTTONS	ACTION
UP	Hold **BTN2**	Frequency zoom, in three steps. Full and Extended: full span, 5 kHz, 1 kHz. Hi-Res: 1 kHz, 200 Hz, 60 Hz.
DOWN	—	Slide the level window up and down. Works with the 40 or 20 dB window.
LEFT / RIGHT	—	Move the cursor; hold to move faster. Works only on a stopped or averaged trace.
HOME	Triple-press **BTN2**	Settings page.
—	Hold **BTN1**	Leave F6.

The cursor shows the exact frequency and level at its position. When an averaged run finishes, the screen shows `AVG COMPLETE` with a reminder of the cursor, reference and new-measurement keys.

READING THE DISPLAY

Shown on its own, the current trace is white. When a reference is shown with it, the current trace is yellow and the reference is cyan. Where the two overlap the colour is blended, so the solid coloured band between the two tops is exactly the difference between them.

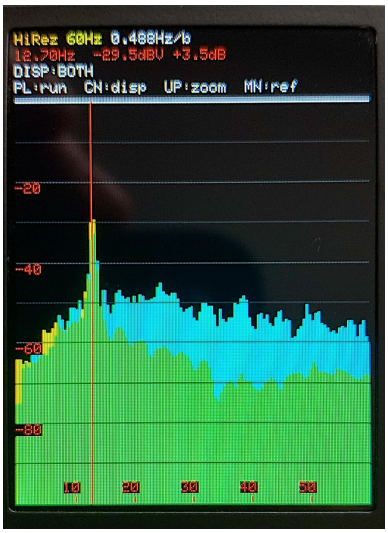
> **NOTE** the reference trace is kept only while F6 is open. It is lost when you leave F6 or switch off. To compare across weeks or months, photograph the screen.

EXAMPLE: TONEARM AND CARTRIDGE RESONANCE

Every tonearm and cartridge combination has a low-frequency resonance. Commonly recommended is a resonance between about 8 and 12 Hz: high enough to stay clear of warps and footfall, low enough to stay below the music. In F6 the cartridge itself is the sensor; no accelerometer is needed.

1. In `F6 SETTINGS` choose `Hi-Res 1 kHz`, and 24 or 36 averages.
2. Play side A, track 4. It starts with two minutes of silent groove.
3. Press **PLAY** to start, then **PLAY** again to start the averaged run. Keep still while it runs.
4. When the run is complete, press **UP** twice for the 60 Hz window and move the cursor onto the low-frequency peak.

With this method I measured 12.7 Hz on a Dual 601 with an Audio-Technica cartridge. The same view shows rumble and motor artefacts.

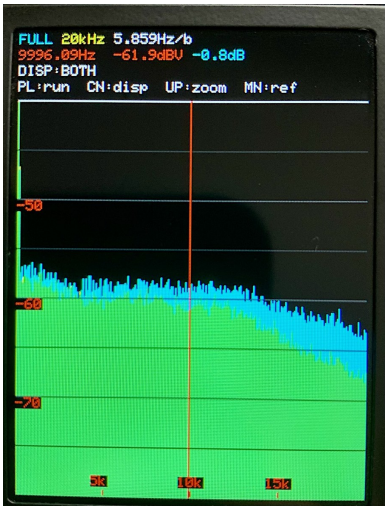


HI-RES 60 HZ WINDOW · ARM AND CARTRIDGE RESONANCE AT THE CURSOR

EXAMPLE: HIGH-FREQUENCY RESPONSE WITH WHITE NOISE

Side B, track 4 ends with one minute of white noise. In Full range with 36 averages it shows the overall high-frequency response of cartridge and phono stage in one picture. Store one trace as the reference, change one thing, such as the cartridge loading, and measure again: the coloured band shows exactly what changed.

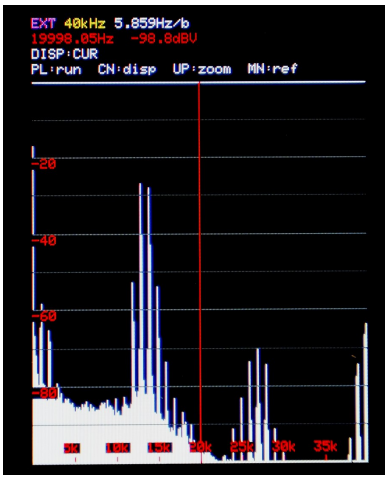
This is also where wear shows in a way you can see. In my 700-hour case study, the white noise spectra of the new and the worn stylus were indistinguishable below about 10 kHz; above it, the worn stylus fell away progressively. Almost all musical energy lies below 10 kHz, and the ear adapts to a slow loss of the top octave, which is why wear goes unnoticed for so long.



WHITE NOISE · CURRENT AND REFERENCE TRACES COMPARED

EXAMPLE: EXTENDED RANGE

At the normal sampling rate the spectrum ends at 20 kHz. Extended range raises the sampling rate to 96 kHz and the display to 40 kHz, so the 2nd harmonic of a test tone up to about 20 kHz, and the 3rd harmonic up to about 13 kHz, become visible and can be read with the cursor. Remember that above 20 kHz the result also includes your phono stage's own response, so compare like with like.



EXTENDED RANGE · HARMONICS ABOVE 20 KHZ

SECTION 09

FIRMWARE UPDATES

StylusScope updates its own firmware from a USB memory stick. No computer connection and no software are needed. An update changes only the firmware: the odometer, the baselines, the wear log, the analyser settings and the calibration are all kept.

You need a USB memory stick formatted as FAT32.

1. Download the update from stylusscope.com.
2. Copy it to the top level of the stick, not into a folder, named exactly `firmware.bin`.
3. Disconnect the USB power cable from StylusScope.
4. Hold **BTN2** and reconnect the power. Keep holding until `RELEASE THE BUTTON NOW` appears, then release.
5. `USB MENU` appears with `1. Firmware Update` selected. Press **BTN1** to select it.
6. Insert the stick into the **USB-A** socket when the screen asks for it.
7. StylusScope checks the file and shows `UPDATE?` with the current and the new version numbers.
8. Press **BTN2** to install. The screen shows `FLASHING`, `DO NOT POWER OFF` and a progress bar.
9. When the screen shows `UPDATE OK`, StylusScope restarts with the new firmware. Remove the stick.

> **CAUTION** do not disconnect the power while `FLASHING` is on screen.

To cancel before installing, hold **BTN1**; StylusScope restarts with its existing firmware. If anything goes wrong, from a damaged file to a removed stick, the screen ends with `Firmware unchanged.` and the existing firmware stays in place and keeps working. StylusScope accepts only genuine StylusScope firmware and shows `Not a StylusScope image` for any other file. An older version can be installed the same way if support ever advises it; the version numbers are always shown before you confirm.

SECTION 10

THE STYLUSSCOPE TEST RECORD

The Test Record was made for this instrument. I specified the tracks; the master was cut at Artone Studio and the record pressed by Record Industry in Haarlem, the Netherlands. The plant was founded in 1958 under the Artone name, became Sony's main vinyl production facility for Europe, and in the 1980s pressed more than 35 million copies of Michael Jackson's Thriller.

Shipping one record with every instrument matters more than it first appears. Test records do not share a common reference level: "0 dB" on one record can be a different groove velocity from "0 dB" on another, sometimes quoted as a peak value and sometimes as RMS. A distortion figure measured on one record cannot be compared with one from another. Every StylusScope reading comes from the same pressing of the same master, so every reading in the collective data can be compared with every other.

A voice announcement names each new test signal before it plays, so you always know where you are on the record. There are 5 seconds of silence before and after every announcement and every test signal.

10.1 TRACK LIST

SIDE A

TRACK	CONTENT	LEVEL
A1	**Stylus wear test: 5 kHz**, then 8 kHz and 3 kHz, 1 minute each. The 5 kHz tone is the standard wear measurement.	−12 dB
A2	CCIF intermodulation, lateral: 1 & 1.4, 4 & 4.4, 8 & 8.4, 13 & 14 kHz, 1 minute each	−12 dB
A3	Vertical cut, inverted phase: 4 kHz, 8 kHz, 4 & 4.4 kHz, 13 & 14 kHz, 1 minute each	−12 dB
A4	Silent groove (2 min), then 5 kHz lateral (1 min). Not for wear checks.	0 dB

SIDE B

TRACK	CONTENT	LEVEL
B1	Reference tone, 1 kHz, 5 cm/s, both channels in phase (mono), 2 minutes	0 dB
B2	Frequency response: 1 kHz, then 100 Hz, 500 Hz, 2, 5, 10, 12, 15, 18, 20 kHz, 30 s each	−20 dB
B3	Channel separation and azimuth: 1 kHz left only, right only; 10 kHz left only, right only, 1 minute each	0 dB / −12 dB
B4	Sweep 1–20 kHz (1 min), then white noise (1 min)	−16 dB

Side A plays for 17 min 40 s and side B for 17 min 24 s.

Some tracks, including the vertical cuts on A3 and the 10 kHz single-channel tones on B3, are there for functions and wear bands that future firmware may use. They need no new record.

10.2 LOOKING AFTER THE RECORD

- Hold it by the edge and the label only, and keep it in its inner sleeve.
- Clean it as you clean your other records. Dust on the wear track reads as distortion.
- Use it for measurements only. Every play wears the groove a little, as it does on any record.

SECTION 11

CARE AND MAINTENANCE

- Clean the enclosure and the display with a soft, dry cloth. Do not use solvents, sprays or abrasive cleaners.
- Clean the stylus with the brush supplied, always from the back of the cartridge towards the front, never sideways.
- Remove the batteries from the remote control if it will not be used for several months.
- Store the Test Record upright, in its sleeve, away from heat.
- StylusScope needs no calibration or adjustment by the user. Its calibration is set at the factory and is kept through firmware updates.

SECTION 12

TROUBLESHOOTING

Find what you see in the left-hand column. The checks are listed in order of likelihood.

POWER, DISPLAY AND REMOTE

WHAT YOU SEE	WHAT TO CHECK
Screen dark, LED off	USB cable firmly in at both ends; the USB power source switched on and able to supply 500 mA. Try another charger.
Screen dark, LED green, blue or orange	Normal: StylusScope is in standby. Press **BTN1** to wake it.
Remote does nothing	Batteries fitted the right way round and not flat; a clear line of sight to the infrared receiver on the front face; the IR receiver cover removed.
StylusScope reacts on its own, or to another remote	Another remote control in the room uses the same codes. Fit the IR receiver cover between measuring sessions (Section 4.6).
`PRO UNLOCK` screen appears	**MENU** was pressed in standby. Press **MENU** again to cancel. Your StylusScope already has every function enabled.
`NOT CALIBRATED`	The factory calibration is missing. Contact support with your serial number.

MEASUREMENT

WHAT YOU SEE	WHAT TO CHECK
Frequency jumps about, levels near zero	No signal reaches **INPUT**: phono stage switched on, cables in **INPUT** (not only in **PASS-THR.**), record playing.
`LEVEL` above 500 mV, or THD high on every track	The input is too hot. Set the attenuator to −10 dB (Section 6.2).
Levels 10 dB lower or higher than expected	The three DIP switches are not all set the same way. Disconnect the power, set all three alike, reconnect.
`Average first! (Btn1 single)`	You tried to store a reading that was not averaged. Press **BTN1**, wait for `LOCKED/AVERAGED`, then store.
`NOT THE WEAR TEST TRACK`	A baseline can only be taken on the 5 kHz tone of track A1. Play it and measure again.
`MEM is … Hz, not the wear track.`	The reading in memory is not from the wear track. Measure A1 and store it.
`No baseline yet: store it in F2`	This stylus has no baseline. Store one when your setup is final (Section 6.4).

WHAT YOU SEE	WHAT TO CHECK
`LEVEL MISMATCH`	Wrong track (A4 instead of A1), changed phono gain, changed attenuator, or a different cartridge. See Section 7.3.
Distortion lower than the baseline	Expected in the first 50 hours or so: the run-in (Section 7.5).
A deliberate system change, and every check now differs	Replace the baseline (Section 6.5).
Distortion suddenly much higher	Clean the stylus and the record, check tracking force, and measure again.
`Cannot find two HF peaks` (F4)	Play an IMD tone pair (A2 or A3) and measure while both tones are present, not during the announcement.

ODOMETER AND WEAR LOG

WHAT YOU SEE	WHAT TO CHECK
Odometer does not count	StylusScope must be in standby (LED green, blue while playing). If the LED does not turn blue during music, the level at **INPUT** is below 10 mV: check the connections.
Odometer has not counted my listening (manual counting)	Start a session with the red key each time you play records. A session ends after 2 hours; start a new one to go on.
LED stays orange	A wear check is due. Run F2 STYLUS WEAR to clear it.
LED dark in standby	Normal with manual counting when no session is running. Press the red key to start one.
`Already logged.`	This reading was logged earlier. Take a new measurement for a new point.
`Updated entry` instead of `Logged entry`	Normal: a point already existed for this ten-hour period and has been replaced.
`LOG FULL - NOT saved!`	Export the log (Section 7.8). StylusScope then offers to erase it.
`LOG ERROR - NOT saved!` or `CDC LOG OFFLINE`	The log memory did not respond. Switch off and on again; if it persists, contact support. Measurements still work.
Wear History: `No clear trend yet`	Normal until there are enough checks after the run-in for a trend to stand out from the scatter.

REFERENCE MODE

WHAT YOU SEE	WHAT TO CHECK
Stays on `WAITING FOR 5 kHz SIGNAL...`	Track A1 is playing and the 5 kHz tone has started. The signal must be above 50 mV; check the level in Precision mode.
`No reference saved!`	Store a baseline in Precision mode first, from F2 (Section 6.4).
BTN2 does nothing	Normal: Reference mode uses **BTN1** only.

USB MENU, UPDATE AND EXPORT

WHAT YOU SEE	WHAT TO CHECK
`No stick - timeout.`	Insert the stick within 60 seconds of the prompt. Try another stick.
`Bad filesystem`	The stick is not formatted as FAT32. Reformat it on a computer.
`firmware.bin not found`	The file must be at the top level of the stick and named exactly `firmware.bin`.
`Not a StylusScope image`	The file is damaged or is not StylusScope firmware. Download it again.
`Firmware unchanged.`	The update did not complete. Your existing firmware is still installed and working. Try again.

If a problem is not listed here, contact support (Section 14). Please include your serial number and firmware version from the start-up screen, and a photograph of the screen.

SECTION 13

SPECIFICATIONS

ITEM	SPECIFICATION
Inputs	2 pairs of RCA sockets, connected in parallel: INPUT, and PASS-THR. to the next stage
Maximum input level	1 V RMS, below 500 mV recommended; 3 V RMS with the −10 dB attenuator, below 1.5 V recommended
Input attenuator	−10 dB, by three DIP switches on the rear panel (active in the DOWN position)
Input impedance	1 MΩ; 68 kΩ with the −10 dB attenuator
Analogue-to-digital conversion	24-bit, stereo
Sampling rate	48 kHz; 96 kHz in F6 Extended range
Measurement analysis	8192-point FFT (16384-point in F6 Hi-Res and Extended), averaged over 12 readings; F6: 12, 24 or 36
F6 Full range	20 kHz span, 5.859 Hz per bin
F6 Hi-Res	1 kHz span, 60 Hz window in use, 0.488 Hz per bin
F6 Extended range	40 kHz span, 5.859 Hz per bin
F6 level scale	dBV (0 dB = 1 V RMS), 0 to −100 dB; 100, 40 or 20 dB window
F6 averaging	12, 24 or 36 averages
Distortion measurement	THD from the 2nd and 3rd harmonics; 3rd-to-2nd harmonic ratio
Odometer	Counts in standby above 10 mV input; saved every 10 minutes; manual entry up to 9999 h
Wear log	1015 entries; exported as CSV to a USB memory stick
Display	240 × 320 pixel colour TFT, 2.4-inch diagonal
Controls	2 top-panel buttons; infrared remote control (2 × AAA)
USB-C	5 V DC power input: 500 mA maximum, 200 mA typical, 80 mA (0.4 W) in standby
AUX I2C	3.5 mm TRRS socket for future StylusScope add-on devices
USB-A	USB memory stick (FAT32): firmware updates and wear log export
Wireless	None. StylusScope has no Wi-Fi or Bluetooth.
Dimensions (L × W × H)	110 × 105 × 50 mm

ITEM	SPECIFICATION
Weight	320 g
Compliance	CE, UKCA, FCC Part 15 Subpart B (Class B)

Specifications may change as the product is improved.

SECTION 14

WARRANTY, SUPPORT AND COMPLIANCE

14.1 WARRANTY

StylusScope is guaranteed for one year from the date of delivery against defects in materials and workmanship.

If your StylusScope needs repair under warranty, contact support first. Do not send it without a reply: support will confirm the fault and give you the return address in the United Kingdom. Pack the unit in its original packaging.

The warranty does not cover damage from misuse, from connection to unsuitable equipment, from opening the enclosure, or the normal wear of the Test Record and the stylus brush. Your statutory rights are not affected.

14.2 SUPPORT

Email	support@stylusscope.com
Website	stylusscope.com — answers to common questions, video guides, firmware updates and this manual

When you write, please include your serial number and firmware version, both shown on the start-up screen.

14.3 COMPLIANCE

StylusScope meets the requirements of the EU Electromagnetic Compatibility Directive 2014/30/EU and the RoHS Directive 2011/65/EU, and of the corresponding UK regulations. It has been tested to EN 55032 and EN 55035 (Class B), with RoHS conformity assessed to EN IEC 63000. The declarations of conformity are available on request.

FCC STATEMENT (USA)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular

installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Responsible party in the USA: Approve-IT Inc., 8011 34th Ave. South, Suite 342, Bloomington, Minnesota 55425, USA. info@approve-it.net, +1 651-647-5930.

DISPOSAL

The crossed-out wheeled bin symbol on the product means that it must not be disposed of with household waste. At the end of its life, take it to a collection point for electrical and electronic equipment.

MANUFACTURER

Life-Changer Ltd., trading as Paul Grand Audio UK, 18 Old Lane, Manchester M11 1BE, United Kingdom.

StylusScope is a registered trademark of Life-Changer Ltd.

APPENDIX A

THE WEAR LOG FILE

The exported file is plain text in CSV format. It begins with a few comment lines, each starting with `#`: the schema version, the firmware version, the unit serial number, the current stylus and setup numbers, where the current odometer hours came from (0 counted, 1 entered by hand, 2 both), the number of entries and a checksum. The checksum lets the collective database confirm that the file arrived intact.

The next line names the columns. Each following line is one logged check. An empty field means "not measured", which is deliberately different from zero.

COLUMN	CONTENT
`schema`	Format version of the record.
`stylus_id`	Stylus number. A new stylus gets the next number.
`odo_minutes` , `odo_hours`	Odometer reading at the check.
`odo_source`	0 counted by StylusScope, 1 entered by hand, 2 both.
`band_id` , `band`	The test band, for example `5kHz lat -12dB` .
`freq_hz`	The frequency actually measured. Against the nominal 5000 Hz it shows your turntable’s speed error.
`level_L_mV` , `level_R_mV`	Output level of each channel, mV RMS.
`dist_L_pct` , `dist_R_pct`	THD of each channel, %.
`h3h2_L_pct` , `h3h2_R_pct`	3rd-to-2nd harmonic ratio of each channel, %.
`aux_L_mV` , `aux_R_mV`	Second tone level, used only for IMD bands. Empty for the wear band.
`setup_id`	Setup ID at the time of the check.
`vertical`	1 for a vertical-cut band, otherwise 0.
`suspect`	1 if the check was marked as doubtful, otherwise 0.
`baseline`	1 if this entry is a stored baseline, otherwise 0. Added in firmware v9.4b.
`odo_manual`	1 if the odometer was set to manual counting when the check was logged, otherwise 0. Added in firmware v9.4e.

APPENDIX B

GLOSSARY

TERM	MEANING
Averaged measurement	Twelve readings combined into one, for a stable and repeatable result.
Azimuth	The sideways tilt of the cartridge, seen from the front.
Baseline (REF)	The wear measurement stored from F2 early in the life of a stylus, once the setup is final. Every later check is compared with it.
CDC	Collective Data Collection: the shared dataset built from exported wear logs.
Crosstalk	Signal from one channel leaking into the other, in dB below the driven channel.
dBV	Level in decibels relative to 1 V RMS.
FFT	Fast Fourier transform: the calculation that splits a signal into its frequencies.
IMD	Intermodulation distortion: new tones created when two tones are reproduced together.
MEM	The memory slot holding the last stored averaged reading.
Percentage point	The difference between two percentages: 4.5 % to 5.7 % is a rise of 1.2 percentage points.
Pinch effect	A vertical movement of the stylus at twice the signal frequency, caused by the varying width of a laterally cut groove.
Run-in	The first 50 playing hours or so, while a new tip polishes itself in and its distortion falls.
Setup ID	Your number for one turntable and cartridge combination.
Stylus number	The number StylusScope gives each stylus, increased by the new stylus procedure.
THD	Total harmonic distortion; here the 2nd and 3rd harmonics together, relative to the tone.



StylusScope®

Play one track. Get a number. Compare it with the same number from when the stylus was new.

STYLUSSCOPE.COM · SUPPORT@STYLUSSCOPE.COM

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