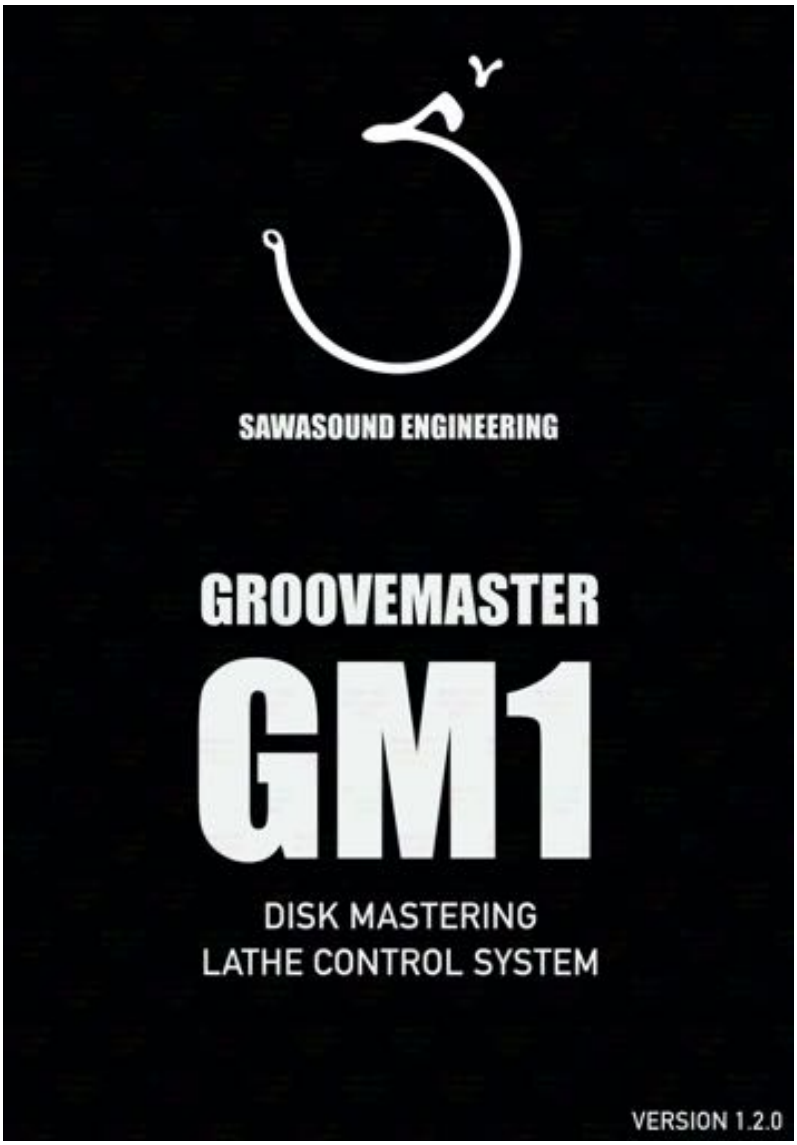


Sawasound Engineering
GM-1

User Manual
2022

Table of Contents

1. Main Features

- 7" Touch Screen Display with all features accessibles
- Manual mode: let you define arbritrary LPI with given range relative to time of cut
- Lead-In/Out, crossovers between tracks are done in one click
- Closed Loop Positionning : go to the beginning of a 7” / 10” or 12” in one click
- 256microsteps motor positioning resolution
- Fast navigating display: fast forward / rewind, position 1, position 0
- Original FlexiGroove new variable pitch algorithm
- Stocks gestion module
- Automatic stocks update
- Keep count of total stylus cutting time
- Native MIDI-USB control (trigger lead-in, crossover and lead out groove with note events)
- Controls activation of amplifier, vacuum suction, lamp and stylus heating in one click (extension)
- Report room & vinyl temperatures (extension)

FlexiGroove Algorithm:
=> Capable of extreme compacting/nesting of grooves
=> Phase Recognition
=> Variable preview time
=> Variable IS time
=> calculate & compensate wow & flutter impact on pitch calculation
=> variable groove width / land width

2. Package Content

=> 1x main unit (w. mic stand adapter mounted)
=> 1x motor unit (with small pulley mounted)
=> 1x motor shaft protection case
=> 1x big pulley
=> 1x big belt
=> 1x small belt
=> 1x printed pitch screw adapter
=> 1x 5v PSU
=> 1x 36v PSU + power cable + motor cable
=> 1x RJ-45 cable

3. Requirements

1x T560 VinylRecorder working system
1x Standard Mic Stand

In order to use the FlexiGroove algorithm:
1x SPDIF coax cable
1x Sound Card / DAC with separate SPDIF coax output

4. Overview

4.1. Home Page

1 Setup new vinyl

Go to setup page

2 Run motor calibration

Run calibration routine (see Calibration

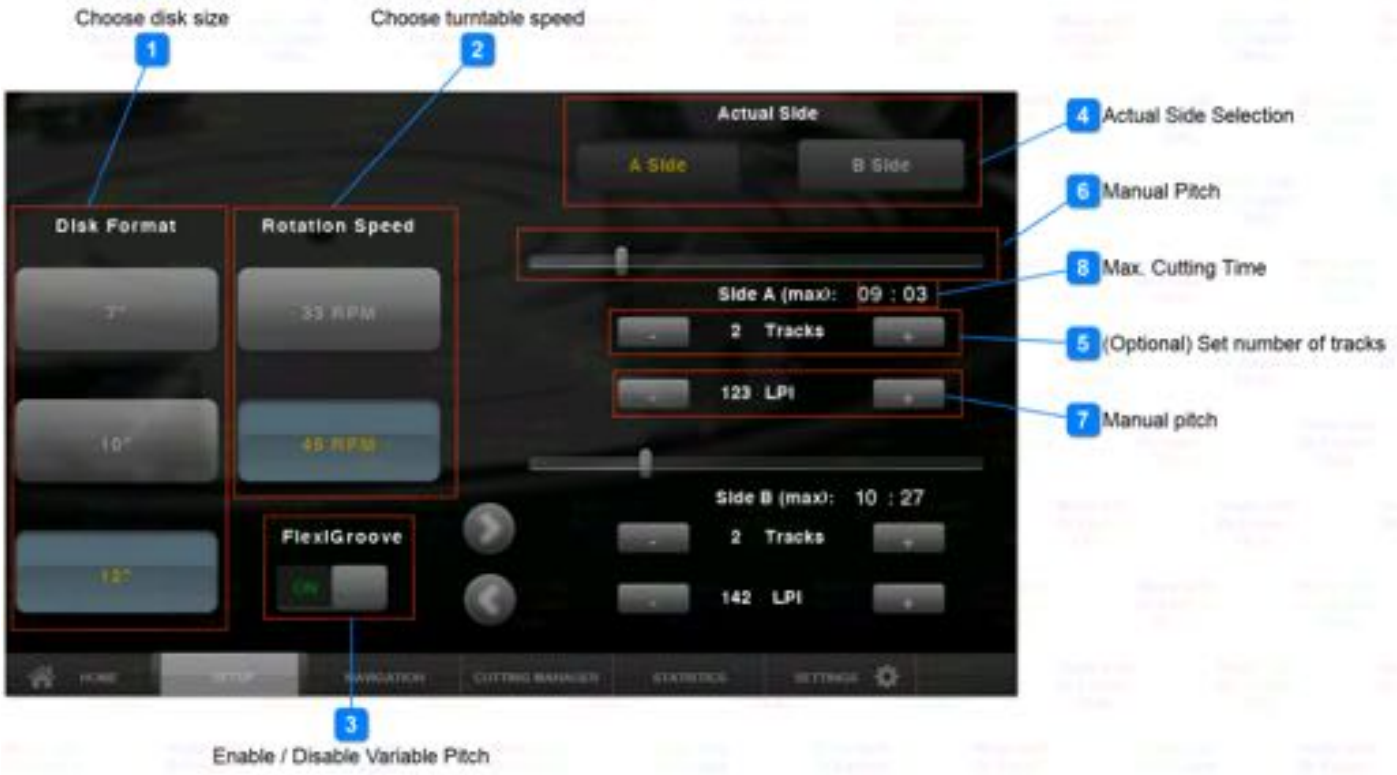
3 Show stocks / statistics

Show stocks / stats page

4 Main menu

Used to access different pages in one click

4.2. Setup Page



1 Choose disk size

Disk format selection (supported formats: 7", 10", 12")

2 Choose turntable speed

Turntable rotation speed selection (supported speeds: 33⅓ RPM, 45 RPM).
Needed to calculate the pitch. Don't forget to adjust your turntable speed accordingly to this setting.

3 Enable / Disable Variable Pitch

When **ON**, variable pitch "FlexiGroove" algorithm is used
When **OFF**, manual pitch settings are used

4 Actual Side Selection

Mostly used in manual pitch mode, choose actual side to switch easily between Side A pitch setting & Side B pitch setting

5 (Optional) Set number of tracks

Used to optimize RestTime estimation, by taking into account in real time number & total space of left crossover grooves.

6 Manual Pitch

Select pitch value (per side), mostly used in manual mode, can also be used in variable pitch mode to define a default pitch value to switch to in case we want to disable the FlexiGroove algorithm during the cut.

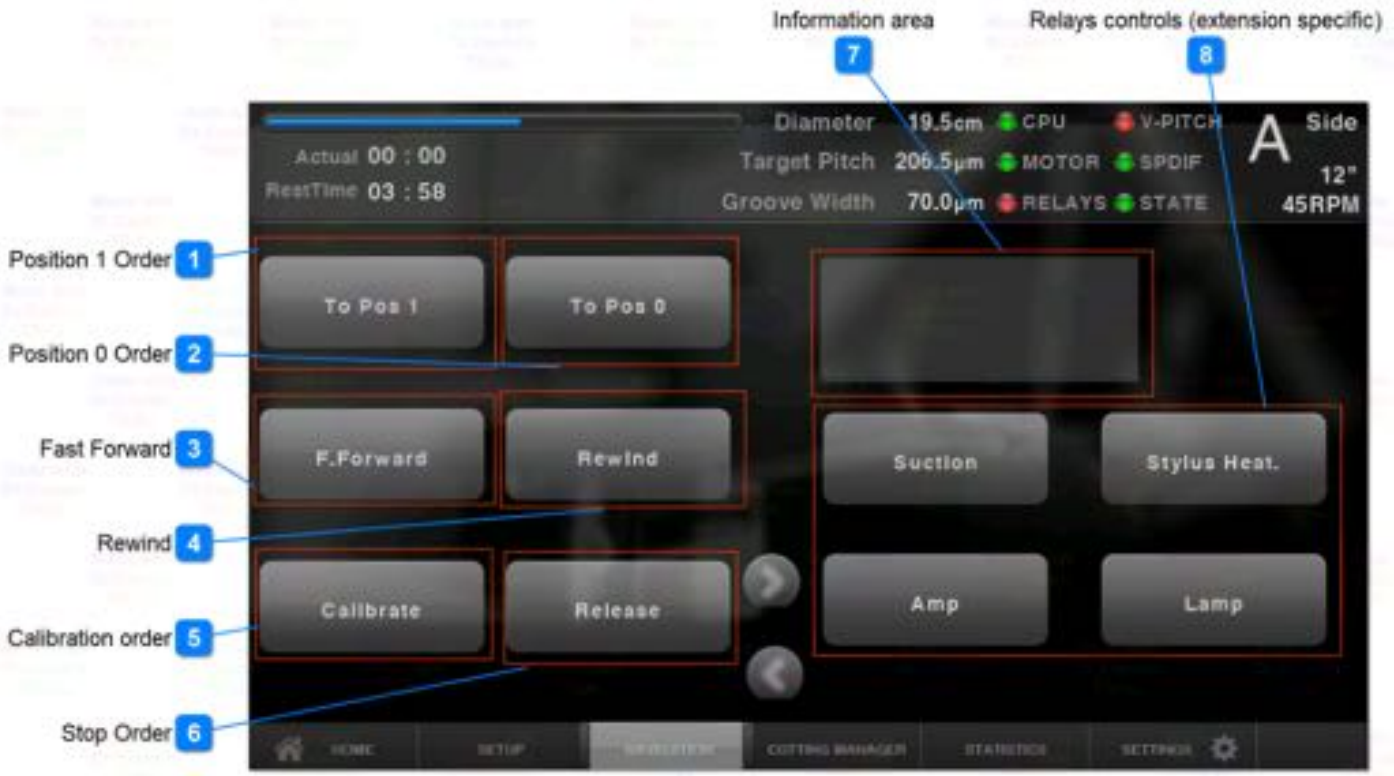
7 Manual pitch

Cf.6

8 Max. Cutting Time

Maximum cutting time in manual pitch mode, by taking into account crossover (number of tracks) / lead-in / lead-out space.

4.3. Navigation Page



1 Position 1 Order

Use this button to go to the beginning of the selected disk format (7", 10", 12") as selected on setup page.

2 Position 0 Order

Use this button to go to the homing position.

3 Fast Forward

Moves cutting head toward disk center.

4 Rewind

Move cutting head to the opposite direction of disk center.

5 Calibration order

Needed by the motor to find home position. At every power-on of the unit, calibration needs to be done once, prior any other thing.

6 Stop Order

Use this button to order immediate release of the motor, it immediately cancels any ongoing move

7 Information area

Used to show up some useful informations.

8 Relays controls (extension specific)

In case Relays Extension is wired to one of the extensions port of the GM-1, this button can be used to control activation / deactivation of Vacuum Suction Unit / Amplifier / Stylus Heating / Lamp.

4.4. Cutting Page

1 Lead-In / Lead-Out Groove

Used to order a direct Lead-In or Lead-Out groove. Depending on the current diameter, once cutting head goes after lead-in max position on disk, the Lead-In button becomes automatically a Lead-Out button.

2 Crossover Groove

Use this button between songs to order a direct crossover groove.

3 Live Settings

The live settings section allow the user to modify manual pitch, land width and groove width even while in cut.
Default value are defined on setup page.
Manual pitch is used when FlexiGroove is disabled, land width & groove width values are used when FlexiGroove is ON.

4 FlexiGroove Enable/Disable

When **ON**, variable pitch "FlexiGroove" algorithm is used
When **OFF**, manual pitch settings are used

5 Start / Stop Cut

Start : Order the motor to start moving at target pitch, you can then lower cutting head and press lead-in button.
Stop: Immediately interrupt actual cut, immediate stop order is sent to the motor.

6 Arm / Unarm (Relays Extension)

In case Relays Extension is wired to one of the extensions port of the GM-1, this button does the following:
Arm: Power-on the Vacuum Suction Unit, wait 2 seconds for current stabilization and then power-on Amplifier
Unarm: Power-off Amplifier, wait 2 seconds for current stabilization and then power-off Vacuum Suction Unit.

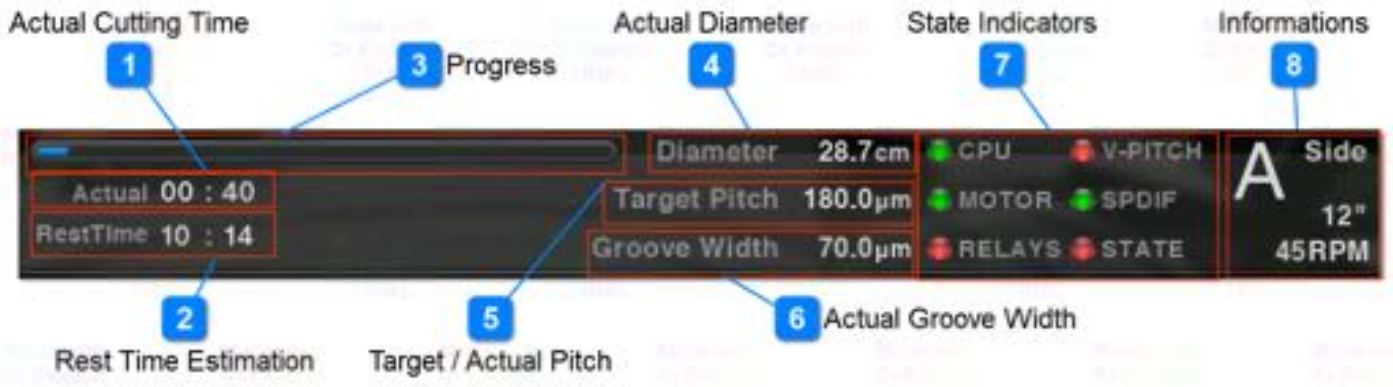
7 Stylus Heating (Relays Extension)

In case Relays Extension is wired to one of the extensions port of the GM-1, this button is used to enable / disable the stylus heating unit.

8 Show Analysis

Future Add-On that will be used to display useful informations like Stylus velocity, Acceleration, Groove Radius & Groove Angles for horizontal & vertical (Mid / Side) parts of the signal.

4.5. State Bar



1 Actual Cutting Time

Displays elapsed time since beginning of actual cut.

2 Rest Time Estimation

Displays an estimation of actual disk cutting rest time. It takes into account crossovers grooves if you have specified the number of tracks per side in the setup page.
In manual pitch, estimation is based on the target pitch. In FlexiGroove mode, estimation is based on the 5 last rotations average pitch.

3 Progress

Displays cutting head progression over actual disk total cutting space (from lead-in start position to concentric end groove position of selected disk format)

4 Actual Diameter

Displays the corresponding diameter to cutting head actual position.

5 Target / Actual Pitch

By default it displays actual target pitch. Click on it to switch between target and measured pitch.

6 Actual Groove Width

Displays actual groove width setting. This value needs to reflect the value of your unmodulated groove width, T560 has no electronic depth control, so it has to be done manually (with the spring balance and a microscope/dino-lite. Report measured value on groove width setting. This is an essential setting that needs to be setup properly when using FlexiGroove algorithm.

7 State Indicators

CPU: Green: CPU Temperature is OK, CPU is responding OK.
Red: CPU temperature too high / CPU not responding.
MOTOR: Green: Motor is connected to the right port, powered-on and operational.
Red: Motor disconnected / Not connected to PSU
RELAYS: Green: Relays extension is connected & operational.
Red: Relays extension disconnected

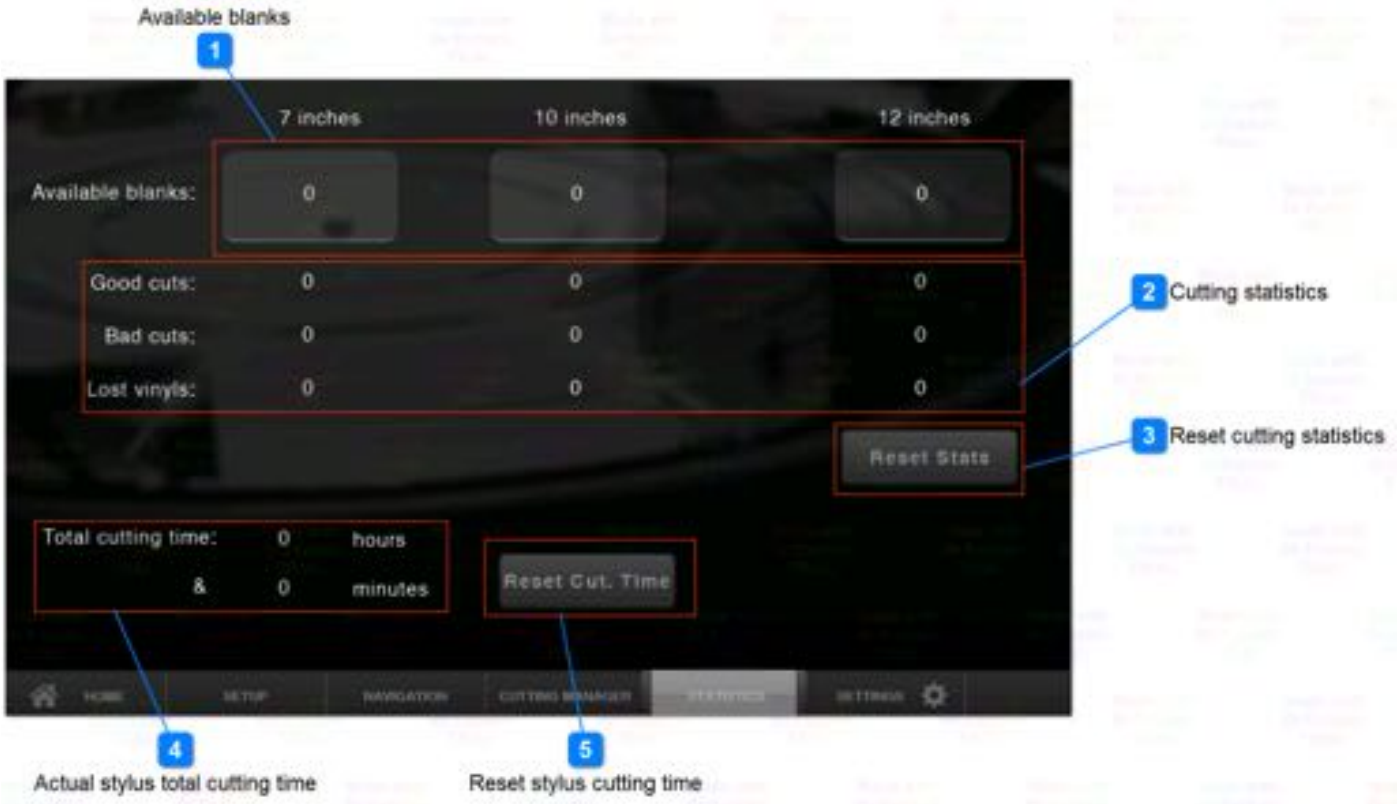
V-PITCH: Green: FlexiGroove algorithm is enabled / Manual pitch mode disabled
Red: Manual pitch is used / Flexi-Groove is disabled.

SPDIF: Green: SPDIF cable is connected and PLL is locked. (GM1 supports up to 96kHz sampling rate frequency input signal)
Red: SPDIF cable is disconnected / PLL not locked.
When no SPDIF signal is detected and V-PITCH is ON, manual pitch is used as default pitch. When a clock signal is found on SPDIF cable, variable pitch is used.

8 Informations

Displays actual side, disk format and turntable speed as selected on setup page.

4.6. Stats/Stocks Page



1 Available blanks

Displays available blanks quantity.
To modify this value, click on corresponding number of desired format, enter new value on the numeric keyboard and click OK.

2 Cutting statistics

Displays quality and number of cuts since last stats reset.

3 Reset cutting statistics

Put all values of Good/Bad/Lost cuts to 0.

4 Actual stylus total cutting time

Displays total stylus cutting time since last cutting time reset.

5 Reset stylus cutting time

Use this when you change stylus, resets cutting time to 0.

4.7. Settings Page

1 Select Settings Category

Choose settings category

2 Select Setting to Edit

Displays selected setting name.
Click here to show a list of all available settings to edit on selected settings category. (you can slide displayed list to show other items.)

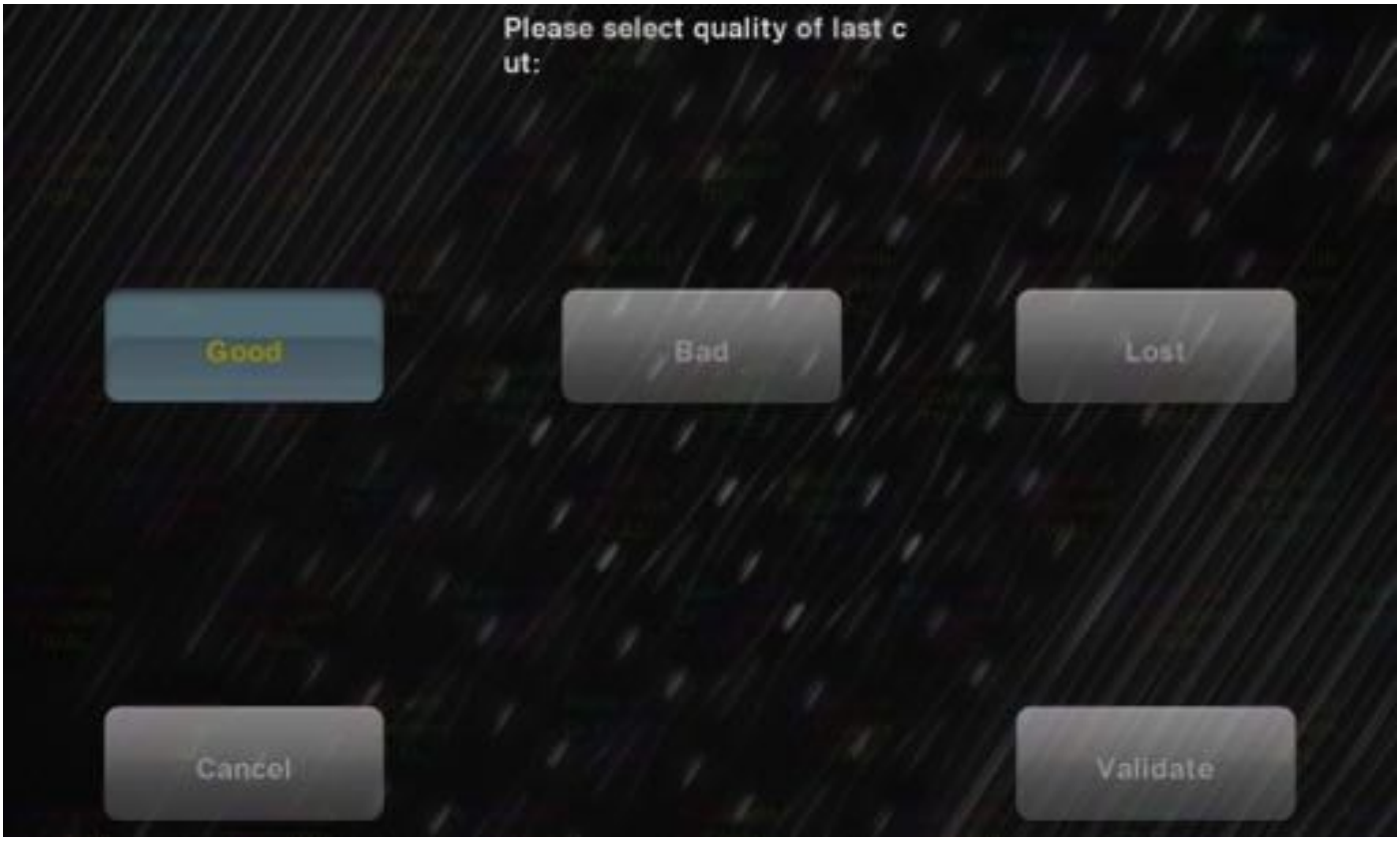
3 Value Field

Displays selected setting value and unit. Click here to modify the value. Save button must be clicked in order to save new value.

4 Position 1 Calibration

Used for Position 1 Calibration.
Cf.5.2.2

4.8. End of Cut Page



Optionally displayed after pressing stop button.

You can choose here cut quality:
Good: stands for a valid cut, if you are on A side, it validates A Side and automatically go to B Side. If you are on B side, it validates a good cut in statistics, decreases available disks quantity of actual format by 1 and go to A side.
Bad: stands for a vinyl that had a problem during cut but can be reused for test purposes (eg: disk is not completely used). It validates a bad cut in statistics, decreases available disks quantity of actual format by 1 and go to A side automatically after validate is pressed.
Lost: stands for a vinyl that has such a problem that it can't be reused (eg: disk is warped). It validates a lost cut in statistics and decreases available disk quantity of actual format by 1. Also go to A side automatically after validate is pressed.

Press **Cancel** button if no cut has been done and vinyl is not used.

5. Physical Ports Description

1 Micro USB Connector

Used when communicating with a computer (eg. Firmware Update)

2 5V DC 2A POWER INPUT

Barrel Jack Power Input connector, use only supplied PSU, failure to do so may damage the unit.

3 MOTOR Communication Port

RJ-45 Motor Communication Port, use it ONLY for connecting the provided Motor Unit to the GM1 Main Unit, failure to do so may damage the unit.

4 Extensions Ports

There are 3 RJ-45 Extensions Ports, use it ONLY for connecting Officials GM1 Extensions to the GM1 Main Unit, connecting something else may damage the unit.

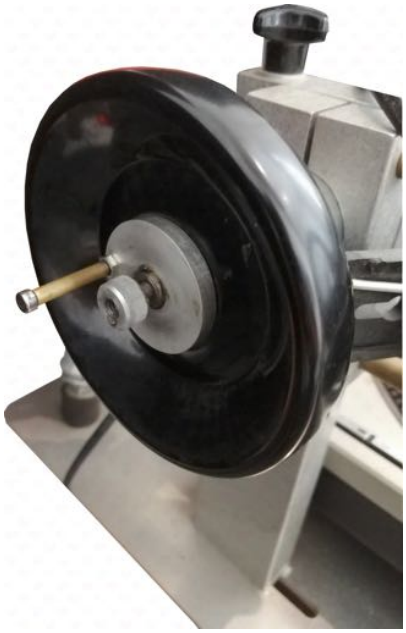
5 SPDIF Coaxial Input

Used to supply the preview signal when used in conjonction with variable pitch algorithm.

6. GM-1 Setup

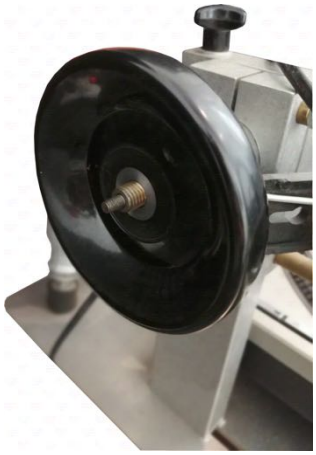
6.1. Hardware Installation

1) Take away the nut



2) Unscrew the crank

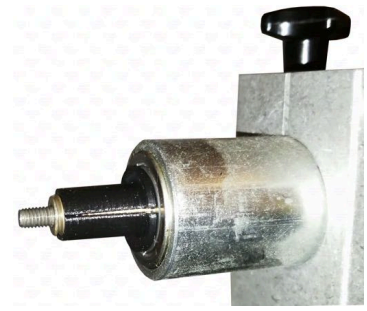
3) Unscrew the black wheel



4) You now have access to the lead screw

5) Place one half of the thread adapter

6) Put the second half, both parts need to be aligned and fully inserted in the thread



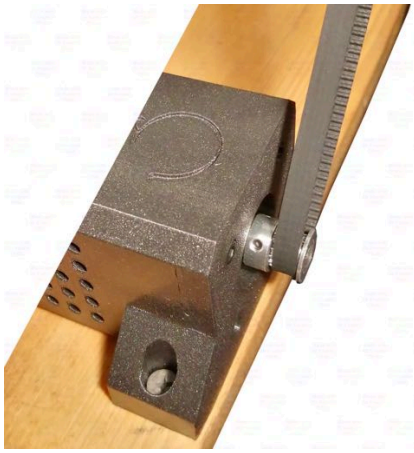
7) Fully insert the pulley, be sure to align one of the threaded hole of the pulley with the flat side of the adapter

8) Screw both threaded holes of the pulley to the adapter, pulley must be perfectly attached to the adapter but do not apply to much strength.

9) Mount the belt between motor's small pulley and lead screw big pulley (there are 2 different belts size provided, use the one that is best fit for your case)

10) Verify belt tension by trying to move the big pulley manually while holding the motor unit, it must be as loosen as possible to act as a good low pass filter but tensioned enough for the motor to not loose any step. If necessary, move motor's position to adjust the tension.

11) When good tension has been found, you can attach the motor to the surface you've chosen with 2xM4 screws (not included)



12) Preferably attach the motor to a surface that can be moved so you can further fine tune belt tension when system will be calibrated.

6.2. Calibration

6.2.1. Position 0 Calibration

Simply click on "Calibrate" button either on Home page or Navigation page. The motor will go to the opposite direction of the centre of the platter until it reaches the end obstacle. The motor will "feel" the load. This procedure is needed for the motor to know his absolute position after a power-off/on.
If motor stops during the homing process and before carriage end, either the belt needs to be loosen, either calibration sensitivity needs to be lowered. Be careful when lowering calibration sensitivity as it can damage your lathe.

6.2.2. Position 1 Calibration

- Set manually the carriage at mid position
- Verify Gear ratio / lead screw pitch settings
- Run calibration 0: if it stops during the calibration process, either loosen the belt, either lower calibration sensitivity.
Be careful with the calibration sensitivity as if set too low it can damage the lathe.
- Run fast forward, put your finger lightly on the cutting head, you must not feel any vibrations due to the motor spinning. If you feel vibrations, loosen the belt. The belt must be loosen enough to act as a lowpass filter but tight enough to not loose steps.
- put a 12 inches vinyl on your platter
- using f.forward button only, position your cutting head to the EXACT edge of the 12", this needs to be done properly as all other positions (eg. beginning of a 7") will be calculated from this registered position.
- once properly positioned, click position 1 reg. button on settings page to save actual position 1. This needs to be done only once. Position 1 will be registered and deduced after proper position 0 calibration at every power-on of the unit.

6.3. FlexiGroove Setup

Left Channel must be in accordance to standards as it is described as the **left inner flank** of the groove

Right Channel must be in accordance to standards as it is described as the **right outer flank** of the groove

The frequency response of the cutting head is presumed to be perfectly flat, so it's up to you to compensate the frequency response if you don't have a feedback cutting head.

Also the algorithm integrates the reverse riaa curve by default, so you can send preview signal pre-riaa. If you send preview signal post-riaa, you must disable RIAA Curve on FlexiGroove Settings Page.
Preview time has to be adjusted accordingly to selected Preview Resolution and turntable speed.

Polarity of your cables must be checked.

Fill up all informations needed in global settings :
Gear Ratio : if no gear is used put it to unity (1.00), included gears results in a gear ratio of 3.25
Screw Pitch: if using T560 it is usually the screw pitch is 1.75mm but you need to verify it in accordance to your exact material
0dB ref Vinyl : 0dB 1kHz reference peak level in cm/sec (lateral) (ex : DIN standards : 11.3cm/sec)

Digital Level Reference is -20dBFS. so -20dBFS 1khz sin wave on left and right channel coming on the SPDIF input must give 0dB ref Vinyl.

Two modes are available : Phase accurate (you need to be sure about the polarity and wiring of all your cables if using this mode), Absolute peak (less efficient)

Preview resolution : x/one rotation time , 2 is a nice setting but you can experiment with different values. Adjust your delay time accordingly to this setting and your turntable speed.

Groove width : Width of an unmodulated groove
Land width : Space between grooves

Comparator Time : is used by the algorithm for surrounding samples comparison to compensate errors due to turntable position inaccuracy (wow & flutter) (disabled if sample rate > 96khZ).

7. Specifications

Input Voltages:
GM1 Main Unit : 5V 2A
Motor Unit : 36V 2A

Supported Sample Rates :
44.1kHz, 48kHz, 88.2kHz, 96kHz

Number of extensions ports :
3

Supported Pitch Range :
2 LPI to 400 LPI
At 3.25 gear ratio (included pulleys) and 1.75mm lead screw thread pitch (usual T560 value)

Supported Disk Sizes:
7", 10", 12"

Supported Platter Speed:
33 1/3RPM , 45RPM

8. Settings

Setting Name	Unit	Recommanded Range	Typical
General			
Calibration Sensitivity		30 <=> 100	46
Gear Ratio		/	3.25 (included gears)
Screw Pitch	mm	/	1.75 (usual T560 lead screw pitch)
Lead-In Pitch	LPI	14 <=> 18	16
Lead-Out Pitch	LPI	2 <=> 6	6
Crossover Pitch	LPI	>= 16	16
0dB Ref Vinyl	cm/s	/	11.3cm/s (lateral modulation (L+R))
Display End Of Cut Page	Yes/No	/	/
Display Unarm Page	Yes/No	/	/
Inverse RIAA Digital Filter	Yes/No	/	/
FlexiGroove			
Comparator Time	µs	0 <=> 1000	630µs (for standard Technics MK2)
Preview Resolution	1 platter rotation / x	1 <=> 10	2
IS Resolution	1 platter rotation / x	16 <=> 64	16
Phase Accurate/ Absolute Peak Mode	On / Off	/	/
Default Groove Width	µm	/	70
Default Land Width	µm	/	30

9. First Cut

After proper GM-1 Setup, calibration and verified Gear ratio / lead screw pitch settings adjustments. Everything is ready to run the first cut.

There is two main modes, manual pitch and variable pitch mode that can be switched even when in cut. When cutting, you can press the "Stop" button at any moment to stop the motor at his current position.

- Go to the setup menu, first choose the size of the vinyl and the RPM, once you have chosen those values you can adjust the land width & groove width if you plan to use the variable pitch. If you want to stay in manual pitch, you can adjust the pitch (in LPI or in µm), accordingly to the pitch you choose and the number of tunes by side there is, it tells you the maximum duration of your vinyl so that you can choose your pitch more easily.

- Go to the navigation page. In the navigation page you can do all the "offline" moves you may want to do. If you choose pos1 for example, the cutting head will move to the exact beginning of the vinyl (accordingly to the vinyl size you have chosen).

- Once you are ready to cut and your cutting head is at the right place, if you have the relays extension, you can press the "Arm" button that will sequentially power up your vacuum suction unit, and then after few seconds (for current stabilisation) it will power up your amplifier (Unarm does the same in the invert way).

- After that you can press START button. This will start the motor. You then put the cutting head down , power up the stylus heating (on souri's main unit or with the relays if you have the relays extension).

- Then you can press Lead-In button, that will make the lead-in groove and will switch at the right position (everything is accordingly to RIAA dimensional standards) to the target pitch you have chosen if you are in manual pitch or variable pitch accordingly to the preview signal.

- After each song end you just have to click on "Crossover" button to do the crossover groove, if you are in manual mode, the crossover duration has been integrated in the pitch calculation estimation during setup. In variable pitch, crossover duration are taken into account for calculating more precisely the rest time.

- When actual diameter goes beyond lead-in max end position, the Lead-in button will become a Lead-Out button so you can click on it at any moment to finish your vinyl. Motor will then stop automatically at the concentric groove position, be sure to leave time to the concentric groove to be written before you put your cutting head up.

- You can then press the Unarm button if having the relays extension.

- Switching side is done in one click on the setup page and so you keep your settings, this is useful especially when working with manual pitch .

- You don't need to worry about positioning your cutting head again, this is done automatically in a single button press in the navigation page.

10. Firmware Update

- Download and install SEUpdater software for your target OS (Windows or Mac).
- Download latest update (latest SAW package)
- Connect a micro-USB cable from the GM-1 main unit to your computer.
- Open SEUpdater, be sure that the main unit is powered on and initialized.
- Click connect button, and choose the correct port.
- Once device has been recognized, you can browse or drag'n'drop your SAW package directly.
- Click Run button.
- Wait until it finished, do not disconnect or power-off the main unit or the motor or your computer during the whole update process.
- Close SEUpdater
- Power-Off and power-on the main unit.
- Done !

11. Midi-USB Control

Lead-in, crossover and lead-out grooves can be triggered during a cut directly from your DAW.

Note C = Lead-In Groove Order
Note D = Crossover Groove Order
Note E = Lead-Out Groove Order

Orders can be triggered with above notes via any midi channel on any octave.
Notes durations are not taken into consideration: lead-in groove will stop at music start position accordingly to RIAA dimensional standards. Crossover and lead-out grooves follow the same principle. However this can be tuned in the GM1 Settings tab (Lead-In Pitch , Crossover Pitch & Lead-Out Pitch settings)

N.B: As a protection, orders can be triggered only during a cut (=when start button has been pressed).

12. Notices

12.1. Important Safety Instructions

WARNING

- Do not modify, disassemble, or open this product. Failure to do so can cause electric shock hazard. Sawasound Engineering cannot be held responsible for damage caused by modifications to this product.

- Internal voltage can be retained inside the product. Do not touch any parts inside the product because there can be high-voltage and high-temperature parts even when the electric current is not applied. This can cause an electric shock hazard or burn injury.

- Use this product only with given Power Supplies.

CAUTION

- Disconnect the power input before connecting inputs and outputs.

- Be sure to read the manual before using this product. For strictly accurate information, request the specifications of the delivered product to check the information. Incorrect usage could lead to an electric shock, damage to the product or a fire hazard.

- If there are differences between the specific information given for your product and this document, the specific information given for your product has priority.

- Do not use the unit near any source of water or in excessively moist environments.

- Care should be taken so that objects do not fall, and liquids are not spilled, into the enclosure through openings.

- When installing the unit, be sure there is adequate ventilation. Improper ventilation will cause overheating, and can damage the unit.

- The unit should be situated away from heat sources, or other equipment that produces excessive heat.

- AC power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to cords at plugs, convenience receptacles, and the point where they exit from the unit. Never take hold of the plug or cord if your hand is wet. Always grasp the plug body when connecting or disconnecting it.

- Follow these general rules when cleaning the outside of the unit: a. Turn the power off and unplug the unit b. Gently wipe with a clean lint-free clothc. Do not use aerosol sprays, solvents, or abrasives

- The AC power supply cord of the unit should be unplugged from the AC outlet when left unused for a long period of time.

- The unit should be serviced by a qualified service personnel when:
a. The AC power supply unit has been damaged; or
b. Objects have fallen or liquid has been spilled into the unit; or
c. The unit has been exposed to rain; or
d. The unit does not operate normally or exhibits a marked change in performance; or
e. The unit has been dropped, or the enclosure damaged.

- Use this product within the specified input voltage, output power, output voltage, output current. Using this product in conditions beyond the specification limits can shorten the lifetime of the product, or can cause, damage to the product, electric shock, or a fire hazard.

- Insert fuses in the input circuit for products in which protection circuits (elements, fuses, etc.) are notinstalled, to prevent smoking or burning. Also for products with protection circuits installed inside, an appropriate use of protection circuits is recommended as there is possibility that the internal protection circuit may not operate depending on the usage conditions.

- The user should not attempt to service the unit beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

- Use only the fuses specified or recommended by Sawasoud Engineering for external fuses.

- Malfunction and failure may be caused if this product is used in a strong electromagnetic field.

- Failure may be caused in the power supply unit due to corrosion if used in environments with corrosive gas(hydrogen sulfide, sulfur dioxide, etc.).

- Malfunction and failure may be caused if this product is used in environments with conductive substancesor dust.

- Be sure to take protective measures against the surge voltage caused by lightning, etc. Damage to the unit may be caused due to irregular voltage.

12.2. Warranty

SawaSound Engineering provides a warranty on all hardware products. This limited warranty gives you specific legal rights. You may also have other rights which vary by state or country.

Warranty Policy
SawaSound Engineering
Limited Hardware Warranty

PLEASE READ THIS LIMITED HARDWARE WARRANTY (THE "LIMITED WARRANTY") CAREFULLY BEFORE USING THE SAWASOUND ENGINEERING HARDWARE PRODUCT (THE "PRODUCT") THAT ACCOMPANIES THE LIMITED WARRANTY. BY USING THE PRODUCT YOU ARE AGREEING TO BE BOUND BY THE TERMS CONTAINED IN THE LIMITED WARRANTY IN THE SAME MANNER AS IF YOU HAD SIGNED A WRITTEN AGREEMENT WITH SAWASOUND ENGINEERING ("SE").

Who does this Limited Warranty Cover?

This Limited Warranty covers only original end users who have purchased the Product from SE or from a SE retailer or distributor whom SE has designated as an "Authorized SE Reseller". This means that, if you are not the original end user, this Limited Warranty does not cover you. It also means that if you purchased the Product from someone other than SE or an Authorized SE Reseller, this Limited Warranty does not cover you even if you are the original end user.

What Does This Limited Warranty Cover?

This Limited Warranty covers any defects in material or workmanship in the Product, except as set forth below.

What Does This Limited Warranty Not Cover?

This Limited Warranty does not cover any defect that is caused by: (i) improper installation, testing or storage of the Product, (ii) use of the Product in a manner that is not in accordance with SE's published documentation, (iii) use of the Product in conjunction with one or more third party products, if the defect would not have occurred but for such third party product, (iv) Acts of God, misuse, accident (including without limitation collision, fire and the spillage of food or liquid), neglect, abuse, alteration, unusual stress, modification, or use in or with an unapproved device, (v) normal wear and tear, or (vi) repairs that are performed by anyone other than SE or a third party whom SE has expressly authorized to perform repair services for the Product within the country in which the original end user purchased such Product. Subject to the proviso that, the European Economic Area shall be considered one "country" for purposes of this paragraph. In addition, this Limited Warranty is void if a Product is returned with removed, damaged or tampered labels or any alterations (including the unauthorized removal of any component or external cover).

How Long Does The Coverage Last?

The warranty period is one (1) year from the date on which the original end user purchased the Product from SE or an Authorized SE Reseller, as demonstrated by a receipt or other proof of purchase reasonably acceptable to SE ("Proof of Purchase"), except that, if you are a consumer, you reside in the European Economic Area (EEA) and you purchased the Product in the EEA, the warranty period is two (2) years from such date.

What Do You Have To Do to Make a Warranty Claim?

SE will not provide any warranty coverage unless your claim is in compliance with all terms of this Limited Warranty and you follow proper return procedure. To obtain warranty service, please register your claim at claim@sawasoundengineering.com . SE may require you to first obtain a Return Material Authorization ("RMA") and return the defective Product together with your Proof of Purchase to SE at the address specified by SE in connection with the RMA. You shall bear the cost of shipping the Product to SE and SE shall bear the cost of shipping the Product back to you after the completion of service under this Limited Warranty if your claim is covered by this Limited Warranty. Any Product returned to SE without a valid warranty claim, without an RMA or without Proof of Purchase may be rejected, returned to you at your cost or kept for a 30 days for your pick-up and then disposed of in SE's sole discretion.

What Will Sawasound Engineering Do If You Make a Valid Warranty Claim?

If SE authorizes you to return your Product to SE, SE will, at SE's option, either repair or replace the defective Product, using new or re-conditioned components, it being understood that if SE elects to replace the defective Product, the replacement may be a different model, provided that such model contains features and functionality that are at least as robust as the model of the Product being replaced. By sending the Product for replacement, you agree to transfer ownership of the original Product to SE. SEwill not return the original Product to you and the replacement product will not contain your data. SE warrants that repaired or replaced products are covered for the greater of either the remainder of the Limited Warranty for the original Product or 90 days.

Are the Rights Described in this Limited Warranty the Only Recourse You Have for a Defective Product?

Some jurisdictions give end users legal rights in addition to those described above. By way of example:

•In Ireland, consumers who purchase defective products may avail themselves of the rights contained in the Sale of Goods Act 1893 (in particular Sections 12, 13, 14 and 15), the Sale of Goods and Supply of Services Act, 1980 and the European Communities (Certain Aspects of the Sale of Consumer Goods and Associated Guarantees) Regulations 2003 (S.I. No.11/2003);

•In England, consumers who purchase defective products may avail themselves of the rights contained in The Sale of Goods Act 1979 (in particular, Section 12), the Supply of Goods and Services Act 1982 (in particular Section 2) and the Sale and Supply of Goods to Consumers Regulations 2002; and

•In Australia, (i) consumer products come with certain guarantees that cannot be excluded under the Australian Consumer Law, (ii) the consumer is entitled to a replacement or refund for a major failure and for compensation for any other reasonable foreseeable loss or damage and (iii) the consumer is entitled to have the goods repaired or replaced if the product fails to be of acceptable quality and the failure does not amount to a major failure.

These are just a few examples of laws around the world that give end users rights beyond those set forth in this Limited Warranty and do not constitute an exhaustive list. For more information about your specific legal rights, please contact your local authority, trading standards department, citizens advice bureau or local equivalent.

SE DOES NOT SEEK TO LIMIT AN END USER'S WARRANTY RIGHTS TO ANY EXTENT NOT PERMITTED BY LAW. BUT, TO THE EXTENT THAT APPLICABLE LAW DOES NOT PROVIDE FOR SPECIFIC RIGHTS (OR ALLOWS THE END USER TO WAIVE SUCH RIGHTS), THE RIGHTS DESCRIBED IN THIS LIMITED WARRANTY SHALL BE EXCLUSIVE. THIS MEANS THAT SE AND SE AUTHORIZED RESELLERS MAKE NO WARRANTIES OR REPRESENTATIONS, EXPRESS OR IMPLIED, REGARDING THE PRODUCT AND HEREBY EXPRESSLY DISCLAIM THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NONINFRINGEMENT OF THIRD PARTY RIGHTS. IN SO FAR AS APPLICABLE LAW ALLOWS SUCH DISCLAIMER ONLY AFTER THE END OF THE LIMITED WARRANTY AS SET FORTH IN THIS DOCUMENT, SE HEREBY AGREES THAT THE DISCLAIMER SHALL ONLY APPLY AFTER THE EXPIRATION OF THE LIMITED WARRANTY.

Assuming You Have Established a Claim Relating to a Defective Product (whether under this Limited Warranty or Applicable Law as set forth in the Preceding Paragraph), are your Remedies Limited to Those Set Forth Under the Paragraph Above Entitled: "What Will Sawasound Engineering If You Make a Valid Warranty Claim?"

Some jurisdictions do not allow manufacturers to limit the remedies available to end users for product defects. For example, most jurisdictions prohibit manufacturers from limiting damages where the defect results in death or personal injury. For more information about your specific legal rights, please contact your local authority, trading standards department, citizens advice bureau or local equivalent.

SE DOES NOT SEEK TO LIMIT END USER'S REMEDIES TO THE EXTENT THAT APPLICABLE LAW PROHIBITS SUCH LIMITATION. BUT, TO THE EXTENT THAT APPLICABLE LAW DOES NOT PROHIBIT SUCH LIMITATION, NEITHER SE NOR ANY SE AUTHORIZED RESELLER SHALL BE LIABLE TO YOU, WHETHER IN CONTRACT, TORT, NEGLIGENCE OR PRODUCTS LIABILITY, FOR ANY CLAIM, LOSS, OR DAMAGE, INCLUDING BUT NOT LIMITED TO LOST PROFITS, LOSS OF USE, BUSINESS INTERRUPTION, LOST DATA, OR LOST FILES, OR FOR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER ARISING OUT OF OR IN CONNECTION WITH THE USE OF OR INABILITY TO USE THE PRODUCT, OR THE PERFORMANCE OR OPERATION OF THE PRODUCT, EVEN IF SE AND THE SE AUTHORIZED RESELLER (AS APPLICABLE) HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL SE OR A SE AUTHORIZED RESELLER'S TOTAL LIABILITY TO YOU FOR ALL DAMAGES, LOSSES, AND CAUSES OF ACTION WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHERWISE EXCEED THE AMOUNT PAID BY YOU FOR THE PRODUCT.

General

No oral or written information or advice given by SE or anyone purporting to speak on behalf of SE shall create a warranty or in any way increase the scope of the Limited Warranty set forth in this document. If any term is held to be illegal or unenforceable, the legality or enforceability of the remaining terms shall not be affected or impaired.

If you have any questions concerning this statement of limited warranty please contact Sawasound Engineering at 128 rue La Boétie 75008 Paris.

12.3. Maintenance

The unit is internally calibrated at the factory. No internal user adjustments are available.

12.4. Repair Service

If you are having trouble with GM1, the first check all system setups, connections, software installations. If that doesn't help, contact Technical Support (support@sawasoundengineering.com)

13. Appendix

13.1. FlexiGroove Preview Times

When using Variable Pitch Algorithm, delay the main signal accordingly to those values.

Necessary Preview Times (in ms) :

Preview Resolution	33RPM	45RPM
1	1800	1334
2	**900**	**667**
3	600	445
4	450	334
5	360	267
6	300	223
7	258	191
8	225	167
9	200	149
10	180	134

You may need to decrease the total delay time by a few ms if necessary to compensate your DAC converter output latency.

13.2. Some Nesting Frequencies

Some nesting frequencies (for lateral modulations ONLY) :

33RPM	**45RPM**
440Hz (A)	264Hz (C)
550Hz (Db)	297Hz (D)
660Hz (E)	330Hz (E)
990Hz (B)	371,25Hz (Gb)
	396Hz (G)
	412,5Hz (Ab)
	495Hz (B)

13.3. T560 Pitch Correspondance Table

T560 Approximative Pitch Correspondances Table, this is subject to variation due to tolerance in analog components of original T560 main unit.

		33RPM		45RPM
T560 Pitch Pot. Value	**LPI**	**um**	**LPI**	**um**
0	+inf	0	+inf	0
10	346	74	324	79
20	179	142	242	105
30	135	188	175	145
40	107	237	134	190
50	83	305	109	232
60	71	360	94	271
70	58	441	86	297
80	54	467	75	337
90	51	495	71	358
100	48	534	63	401