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Makua, ***the Preamplifier***

User's Manual

Packing List

Your product was shipped with the items checked below. Please verify that you find all items mentioned in this list before you start setting up:

Item	Qty	Shipper's signature
This Manual	1	
Pair of Cotton Gloves	1	
Preamplifier	1	
Power Cord	1	
Standard Remote Control Unit		
Premium Remote Control Unit		
Shipping Carton (Brown)	1	
Display Carton (White with Logos)	1	
Carrying Case (Black)	1	
Phono Option (internal)		
DAC Option (internal)		

Please read this manual before operating the unit

Welcome

First off, congratulations! With the purchase of this product you have joined a growing community of audiophiles who value truthful sound reproduction and who consider neutral and transparent electronics a cornerstone in this pursuit. We at Mola-Mola made it our primary goal to build electronics capable of passing a signal with no discernible change at all. Amplifiers make the signal bigger, converters turn the signal from a digital representation into an analogue one. In all these processes we strive to add nothing and to remove nothing.

Through our work designing professional audio equipment we have collected extensive knowledge of how to achieve total freedom from colouration without having to resort to minimalist circuitry. This allows us to build products that are purist without cutting back functionality. So we decided that our preamp should be complete. *Very* complete.

The basic Makua Preamplifier is an extremely transparent gain stage and a programmable routing matrix. The chassis has ample room to fit in optional extras, most notably a DAC and a phono stage.

The 6 preset buttons are programmable via Bluetooth to access any combination of channel, processing and routing. In a system with mainly digital sources, the preset buttons would be programmed to select between them. Vinyl lovers on the other hand might want to use several buttons to select the same turntable but with different EQ settings to suit their large collection of historic LP's. All five inputs are switchable between XLR and floating RCA connections, and all can be assigned as either phono or line.

We wish you a lifetime of musical enjoyment with this product and thank you for your custom.

Bruno Putzeys, CTO and Designer.

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Important Safety Instructions

Mola-Mola gaat er van uit dat u deze Engelstalige tekst volledig begrijpt. Als u hier moeite mee heeft dient u contact op te nemen met Mola-Mola. Op verzoek sturen wij u een vertaling toe.

Mola-Mola geht davon aus, dass Sie diesen Englischen Text völlig verstehen. Wenn notwendig, nehmen Sie bitte Kontakt auf mit Mola-Mola. Auf Wünsch wird Ihnen eine Übersetzung zugeschickt.

Mola-Mola suppose que le lecteur comprend parfaitement le texte en Anglais ci-dessous. En tout cas de doute veuillez contacter Mola-Mola. Une traduction sera vous envoyée sur demande.

Mola-Mola da por supuesto que el texto en versión Inglesa no ofrece ninguna duda de interpretación y se entiende integramente. Si este no fuese su caso rogamos contacte con Mola-Mola quien, a petición, se encargaría de enviarle la correspondiente traducción.

Throughout this document, some aspects of operation that have a potential impact on safety or reliability are noted with the words “Warning” and “Caution”. Take particular care reading and understanding these items. Paragraphs marked with “Warning” explain safety measures required to maintain your personal safety. Paragraphs marked with “Caution” pertain to danger to the equipment itself or to connected equipment. Please follow these precautions when using this product:

1. Read these instructions.
2. Keep these instructions.
3. Follow all instructions.
4. Heed all warnings.
5. Install in accordance with the manufacturer’s instructions.
6. Use only attachments or accessories specified by the manufacturer.
7. WARNING: Dangerous voltage is inside this apparatus. Opening is only allowed by qualified service personnel.
8. WARNING: Do not defeat the safety purpose of the safety earth connection. Use the provided three-prong power cord to insure the product is connected to

safety earth. If the provided mains cord does not fit your outlet, consult an electrician for replacement of the obsolete outlet.

9. Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
10. Unplug this apparatus during lightning storms or when unused for long periods of time.
11. WARNING: Do not use this apparatus near water. Do not expose the apparatus to dripping or splashing. Do not place objects filled with liquids (flower vases, drink cans, coffee cups, etc) on the apparatus. Do not use this apparatus out of doors.
12. WARNING: Clean only with a dry, soft, lint-free cloth. Do not spray any liquid cleaner onto the cabinet, as this may lead to dangerous shocks or malfunction.
13. CAUTION: This unit runs slightly warm when operated normally. Operate in a normally ventilated area.
14. CAUTION: Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat. Avoid exposure to direct sunlight.
15. Use only with a cart, stand, bracket, or table designed for use with audio or music equipment. In any installation, make sure that injury or damage will not result from cables pulling on the apparatus and its mounting.
16. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as when the power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
17. WARNING: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.

Connections & Controls

Rear

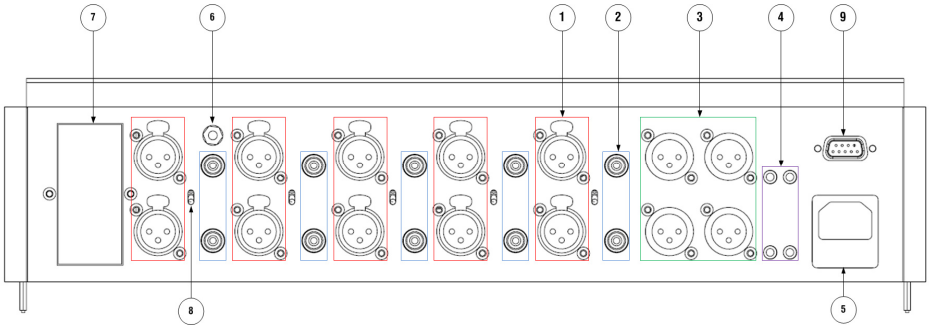


Figure 1: Rear panel overview

#	Function	Notes
1	Analogue inputs, balanced	5 stereo pairs
2	Analogue inputs, unbalanced	5 stereo pairs
3	Analogue Outputs	2 parallel stereo pairs for bi-amping
4	Trigger Outputs	4 programmable outputs
5	Mains power input	
6	Chassis ground terminal	For turntable grounding
7	Option module void cover	
8	(Un)Balanced toggle switch	One for each input pair
9	Serial control port connection	Optional

Table 1: Rear panel overview

Front

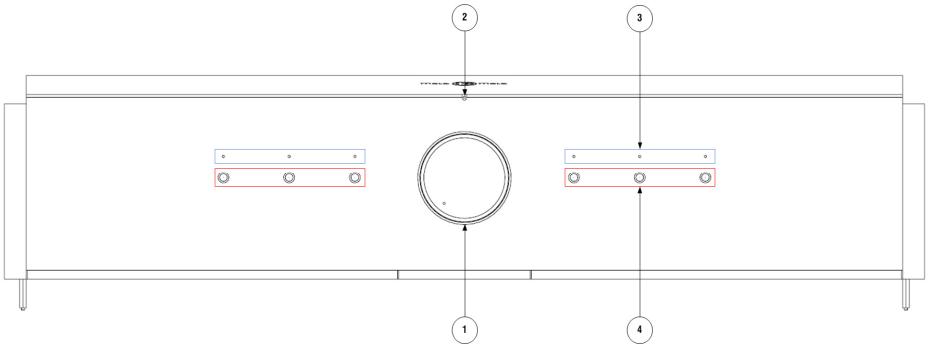


Figure 2: Front panel overview

#	Function	Notes
1	Volume control knob	With indicator LED
2	Power LED	1 LED, white or dim red
3	Preset indicator LED	6 LEDs, white
4	Presets	6 push buttons

Table 2: Front panel overview

Setting Up

Installation

This product relies on free convection of air along the sides and top for cooling. Avoid placing magazines, books or other objects on top of the product as this acts as thermal insulation. Installation inside a cupboard is permissible provided at least 30cm (1') of free space above the product and 10cm (4") around the sides is respected. Operation in closer quarters requires some provision of forced convection (fan) to be installed inside the cupboard.

Connection

CAUTION: Whenever you are plugging or unplugging cables, make sure that the volume control is turned fully down. Failure to take this precaution may result in pops or bangs in the loudspeaker. Use properly shielded interconnects with reliable connectors.

AC Power Input

Connect the supplied power cord to the AC input receptacle on the rear panel. Do not connect the power cord until all the audio input and output connections have been made.

It is usually best to plug the product directly into a wall outlet. Avoid the use of extension cords. A heavy duty multi-tap power outlet strip may be used if it and the wall outlet are rated to handle the total current demanded by the components connected to it.

Your preamplifier has a universal input power supply, allowing it to operate anywhere from 90V to 240V mains. However, as an anti-grey-market measure, products sold in some territories may refuse to operate from a mains voltage other than the one in regular use in that territory. If you are planning to move overseas, consult with your retailer to have the voltage range unlocked. The same should be done if your auditorium is custom-equipped with a non-standard mains voltage.

If you are going to be away from home for an extended period of time such as a month-long vacation, it is a sensible precaution to unplug electronic equipment. Do the same as a precautionary measure during thunderstorms. No amount of surge protection or mains filtering will save your equipment from a lightning strike in the backyard.

Input Connections

Your preamplifier accepts both RCA and XLR type connectors. If your sources have both RCA and XLR outputs, it is exceedingly likely that using the XLR connection sounds best. Depending on which you choose, set the toggle switch to the corresponding input.

Grounding Post

Connect any turntable ground wires to the grounding post to minimize the chances of capacitively induced hum on the phono cartridge from the turntable.

Output connections

Two pairs of XLR outputs are provided for the purpose of bi-amping. Both pairs are completely identical. No RCA outputs are provided because Mola-Mola considers balanced (XLR) connections to be fundamentally superior. If you need RCA outputs to interface with a power amp that lacks balanced inputs, most commonly available adapter cables or plugs will work fine. Keep in mind that pin 2 is hot (signal) and pin 3 carries the reference potential (cold).

Trigger outputs

The four 12VDC trigger outputs can be used for various purposes. The most obvious one is making the power amplifier turn on and off with your preamplifier. Another is lowering a projection screen when a particular source is selected. Any standard 3.5mm jack/jack cable will do (mono or stereo). Although the factory setting is to make all 4 outputs come on as soon as the preamplifier is turned on, they can be linked to individual channels. See the section on advanced control and programming for more details.

Basic operation

Factory Preset Mode

Your preamplifier comes factory-programmed as a simple line amplifier. In this mode:

- The leftmost button selects the leftmost source (source 1) and so on and the rightmost button is used for the internal DAC (if fitted). The DAC select the first input it can find a valid signal on. So for now, think of the preset button simply as input select buttons.
- The trigger outputs are always on.
- XLR/RCA selection is determined by the toggle switches.

Should you wish to return your preamplifier to its factory-programmed state, you can do so by holding down the two buttons directly besides the volume control for one second or more. It makes good sense to do this if this is a unit you're loaning for evaluation and it was sent to you directly by a previous user.

If like most users you only have a handful of line-level sources you can just go ahead and use the unit in this way.

Front Panel Operation

Powering Up

So long as mains power is applied the power LED can be in two states: on or standby. In standby mode it will light up a dim red (barely visible in daylight, bright red standby LED's lighting up the room at night is a pet peeve of the designer). Push any of the 6 buttons to wake up the preamp. The power LED lights up white and the preset you've just pushed will be engaged (as indicated by the LED above the button).

Selecting Inputs

The preset indicator LED lights up solid when the preamp is passing signal and blinks when it is muted. The preamp mutes temporarily for a moment after powering up or after changing presets.

Muting

You can also make your preamplifier mute by pushing the currently selected preset button. Push again or change presets to un-mute.

Powering Down

You can turn the preamp off (place in standby mode) by holding any of the 6 buttons until the unit powers down (about 1 second).

Premium IR Remote Control Operation

The group of six buttons on the remote control mirrors the front panel buttons. Pushing any of them will power the unit on and/or engage the associated preset and/or mute the unit. The top button acts as mute/standby button and does the exact same as the preset buttons except it doesn't switch presets. This is mainly useful because the remote control unit obviously doesn't have LEDs to indicate which preset is engaged and sometimes you just want to mute the unit regardless of what was playing.

The volume up/down buttons operate as they do anywhere else. The LED on the volume knob will come on to provide easy visual feedback of the volume setting.

Standard IR Remote Control Operation

The standard-issue RC unit works slightly differently. The button in the middle of the quadrants turns the preamp on or off (hold 1 second for off). Press this button once for mute or un-mute. Pushing on the left and right quadrants of the ring cycles through the 6 presets. The top and bottom quadrants control the volume. The two lower buttons are not used.

Android® Tablet or Mobile Remote Control

Your preamplifier is fitted with a Bluetooth® module to allow access with a mobile device. To use this feature, install the Mola-Mola Makua app from the Play store. As soon as your mobile device and your preamplifier are within reach the app will display "Connected" in the status bar.

The startup panel shows preset buttons and volume control. Other panels can be reached by swiping. They are explained in the advanced control and programming section.

Powering Up and Down

The status bar (the one that says "Makua – Connected – Standby") acts as power button.

Volume control

Drag the circle around the control arc to change the volume. The actual volume setting is indicated both numerically and by an arrow that tracks the physical movement of the volume knob on the front panel.

Mute

The area with the volume indication acts as mute button. Mute is indicated by a red bar through the volume indication.

Advanced Control and Programming

The factory preset only operates the most basic features of your preamplifier. The architecture is much more powerful, as the signal path diagram shows.

Signal Path

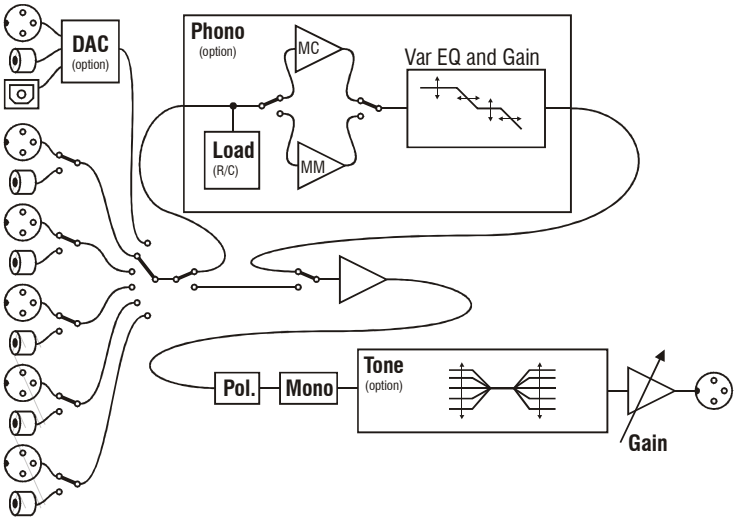


Figure 3: Sketch of the internal signal path.

Everything that can be switched or changed in the above diagram is under software control:

- XLR/RCA switching
- Source selection
- Routing of any input through the optional phono stage
- Variable loading, gain and EQ of the optional phono stage
- Polarity inversion of left, right or both
- Mono summing
- Optional tone control
- Volume

- Balance (independent control of left/right volume)

Programmability

Every thinkable combination of routing and processes can be rolled together for direct access through any of the 6 presets.

Say for instance that you have 2 turntables, each fitted with a different cartridge (most records sound best with an elliptical or VDH stylus but dynagroove cuts positively require a conical stylus). You can then assign one preset button to each turntable, each with its own optimum loading and gain.

Now imagine that some of your most precious historical records are mono, vertically cut with obviously a non-RIAA curve. You can then assign yet another preset to the same input, with the same loading and gain but with one channel's polarity inverted and mono on, and with the EQ that applies to these records.

Tone control can either be set to be the same for all presets or to behave differently for different presets, for instance flat on all channels but a tad rolled off for TV. As a final example, although the RCA/XLR selection is normally controlled using the toggle switches, it can be overridden. In the unlikely case that you have 6 sources you can assign one preset button each to the RCA and XLR pair of one input channel and hence use all 6 buttons to select between 6 sources. Note that crosstalk between RCA and XLR pairs of one input channel is not as low as between different input channels so you should not co-locate two sources that you expect to be putting out signal at the same time.

The Makua App.

The control app for your preamplifier is available on the Google Play store. The app will attempt to contact your preamp and should find it as long as it is within reach and plugged in. Also insure that the Bluetooth function of your mobile device is enabled. Status is announced in the status bar (the grey area at the top).

Figure 4: Status bar while the mobile device tries to contact the preamplifier.

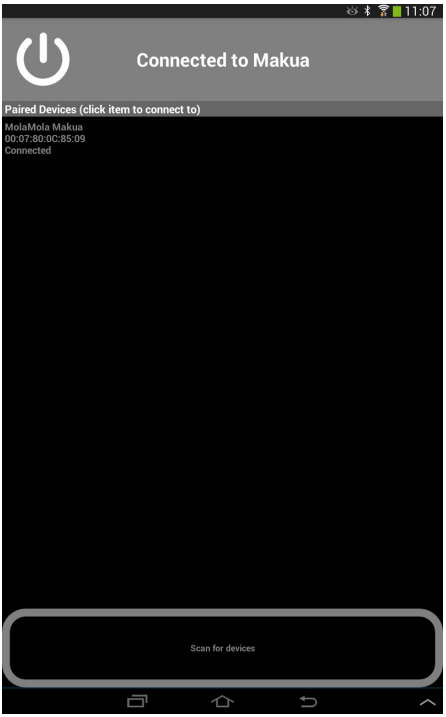


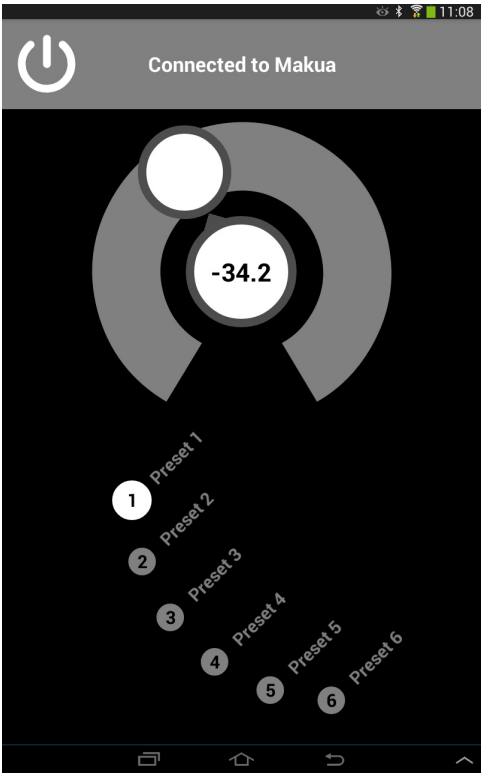
Figure 5: The app is ready to control the preamp, the preamp is on.

The power logo on the status bar turns the preamp on and off. It shows black on grey when off, white on grey when on.

Depending on the options installed in your preamp, the app has up to 5 pages that you can access by swiping.

Home Page

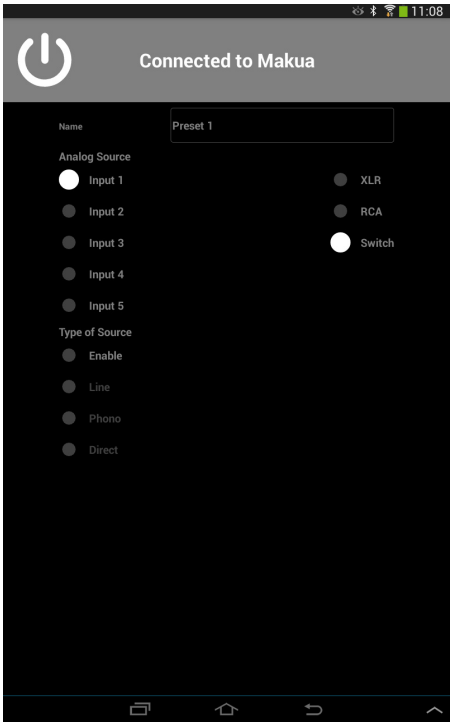
The start-up page is the regular remote control, as outlined in the section about basic operation. Move the white circle around the arc to change volume or click on the arc to go straight to the desired setting.



To program a preset, tap the button of the preset you want to change and swipe left to access the routing for that preset.

Routing Page

Here you can select the input channel and whether the XLR or RCA inputs are to be used. Usually you will want to leave the latter option at “switch” so that the toggle switch on the rear panel controls this.



You can edit the name of the preset, the new name will automatically show on the home page buttons.

There are three types of analogue sources: **Line**, **Phono** and **Direct**. To change the type of source, tap the Enable button first to unlock the three selections. The enable feature is to keep you from accidentally switching to phono or direct during operation.

Line is the normal kind of input.

Selecting **Phono** routes the signal through the phono stage. The configuration of the phono stage is done on another page, see further.

CAUTION: Only select Phono if the selected input is connected to a phono cartridge. Do not select phono if you are using an external phono stage. An external phono stage is a line source. Selecting Phono when a line source is actually attached to this input can potentially damage the phono stage.

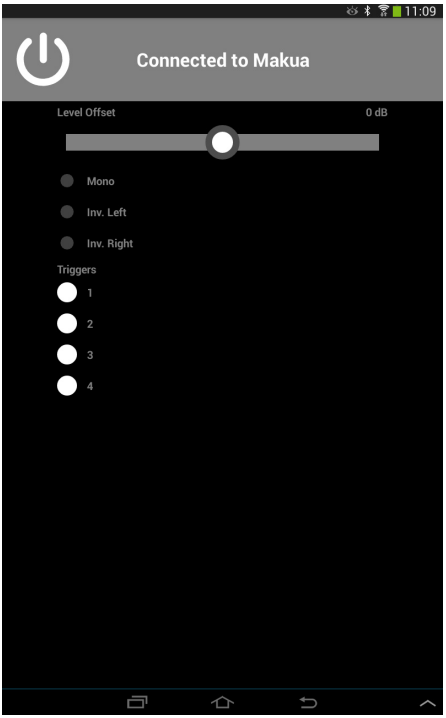
Direct routes the input directly through to the output and disables the volume control. Direct mode should only be used when the source is itself volume controlled. Normally speaking the only use for Direct mode is connecting a surround sound processor when you want to use your stereo system as front left/right in a combined home theatre / hi-fi system. In order to signal that Direct mode is engaged, the power LED on the front panel will turn off (become red) while the LED above the active preset remains on.

CAUTION: Absolutely only select Direct if the source is volume controlled. Direct mode amounts to making a direct connection between the source and the power amps. It is also nearly equivalent to turning the volume all the way up. Engaging Direct mode with a source that is not volume controlled may damage your loudspeakers.

If you have the DAC option fitted, three digital sources will be listed as well, USB, SPDIF and AES. These correspond to the three connectors on the option panel on the rear of the preamp.

Adjustment and Trigger Page

Swipe left from the routing page to get more options for the analogue signal path.



Level offset adds a fixed amount to the volume whenever this preset is active. Use this when you find that you always have to turn the volume up or down compared to other sources.

Mono does what you'd expect: sum left and right together.

The two **polarity invert** buttons invert the polarity (absolute phase) of the left and/or right channel. Inverting one channel is usually not useful, except when playing back vertically cut records which, played back with a modern cartridge, produce out-of-phase left and right. Otherwise, do not invert only one channel. Inverting both channels is occasionally useful if you happen to know that your source has inverted polarity or follows the now-obsolete pin-3 hot wiring scheme. Note that the sonic effect of this is exceedingly subtle so when in doubt, simply leave those two buttons off.

The four **Trigger** buttons correspond to the four trigger outputs on the rear panel. They are always on by default, which is the best setting if you only use them to turn your power amplifiers on. Should you use one for other purposes, say to lower a projection screen when you select an A/V source, simply program this output to be on only when that source is selected.

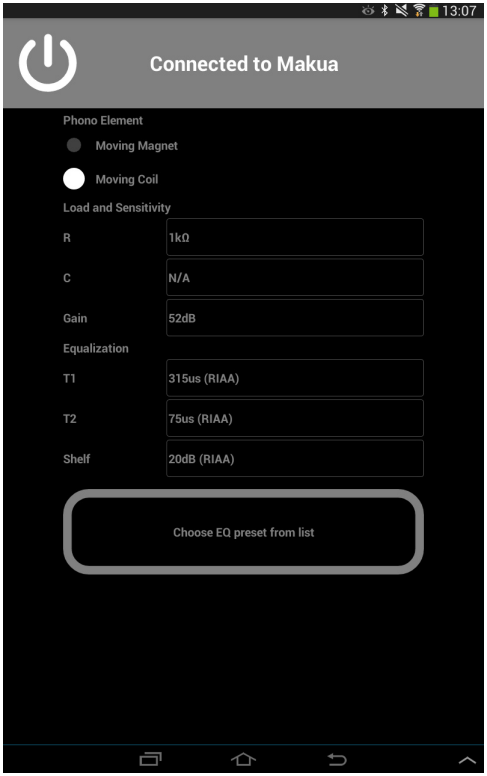
Balance and Update

Swiping right from the Home page lands you on the balance and update page.

Balance is not normally needed unless an acoustic oddity or asymmetrical speaker placement consistently pull the sound stage off centre. If you only have a consistently off centre image with a phono source it's better to readjust your phono cartridge rather than using the balance control.

Setting Up and Controlling the Phono Stage

If you marked the source as Phono, swiping left from the Adjustment and Trigger page will land you at the **Phono settings** page. *Note: Some versions of the app always show the Phono settings tab even when phono is not selected. Changes made to the phono setup when another input is selected have no effect.*



MM/MC selection

In order to insure maximum sonic transparency the phono stage has separate **MC** and **MM** input stages, in contrast with most other phono stages that simply add a gain stage in MC mode.

After choosing between MC and MM, find the correct load resistance and in the case of MM, load capacitance too.

Termination and Sensitivity of MC Cartridges

Moving Coil elements have a low output voltage but also an extremely low output impedance, meaning that excellent signal-to-noise performance can be had with an input optimized for voltage noise. Another side effect is that there is no need to adjust load capacitance. Some cartridge manufacturers insist that even load resistance is uncritical but we decided to add a selection of common load resistances nonetheless. These are in the **R** dropdown box. On the downside, sensitivities of MC cartridges are all over the place so the **sensitivity** of the phono stage needs to be adjustable over a fairly large range. The documentation of your phono cartridge will give an indication or recommendation but by all means feel free to experiment around with sensitivity and load resistance.

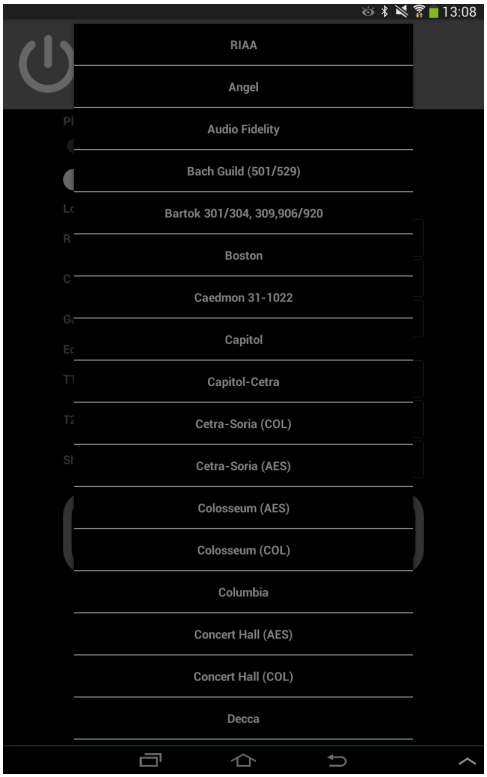
Termination and Sensitivity of MM Cartridges

Moving Magnet cartridges have a fairly high output voltage but also an extremely high output impedance, in particular inductance, meaning that the input stage has to be optimized for current noise. Also both load resistance and capacitance are critical to get a flat response without droop or peaking. The documentation of your phono cartridge should list the optimum loading which is to be taken pretty much as law, not as a mere recommendation. In the **R** dropdown box, select the value closest to the value given by the manufacturer. Then, look up the capacitance of your phono cable and subtract that value from the phono cartridge manufacturer's specification. Set the **C** dropdown box to the value closest to the result. When you have to choose between rounding down or up, keep in mind that a higher C results in more chiseled highs and a lower C in a more rolled off but more controlled and detailed upper octave. Leaving **Sensitivity** at the default 5mV is usually right. This is as far as most phono stages, including external ones, would ever go. The next part is for serious vinyl fanatics with extensive collections of historical records.

EQ Curves

In the early days of vinyl (and certainly shellac) almost every record label had their own EQ curve. Oddly enough they sometimes kept them secret in an early attempt at vendor lock-in, to force music lovers to buy their record player from the label's parent company. History records that the incompatibility wasn't even noticed by the punters so by 1956 most labels were happy to standardize on the curve now known as RIAA. As stereo only came about in 1958, a rule of thumb is that **the vast majority of stereo cuts were made using the RIAA curve**.

Almost all of those historical EQ curves are a combination of a manageable number of time constants which is why it turned out to be feasible to support switchable EQ in the analogue domain.



The **EQ** drop-down box lists all combinations of record labels and periods that we could obtain EQ data of, courtesy of Russell Fischer (www.shellac.org) and Larry Robinson (http://midimagic.sgc-hosting.com/). If you can identify a particular record by its label, just pick the corresponding option and the numbers in the remaining four boxes will be set correctly. If you can't find data you'll have to dial the numbers by ear.

Shelf sets the low shelf. Decrease it if you perceive the bottom end as too thundery or rumbly. Try increasing it if the bass lacks "authority".

T1 sets the bass turnover point. Increase the time constant it if the sound is too woolly, decrease it if the sound is too thin.

T2 sets the treble roll-off. Increase the time constant if the sound is edgy, decrease it if it lacks bite.

We are aware of customers using these settings as a kind of tone control. This is fine of course.

DAC settings

If you selected a digital input and if you have a DAC option fitted, swiping left from the Adjustments and Trigger page will get you to the DAC settings.

The page is mostly empty save for the choice between three different upsampling (reconstruction) filters. Feel free to experiment with those. The filter setting only affects PCM playback. Different upsampling factors are not offered because this is only meaningful in R2R ladder DACs as a measure to mitigate glitch energy which is a problem the Mola-Mola DAC simply doesn't have.

Linear phase selects the filter that most accurately preserves the waveform. For the **minimum phase** selection we expressly designed it to have the exact same magnitude response (what's loosely called "frequency response") as its linear-phase version but no pre-ringing. The reduced pre-ringing filter also has the same magnitude response as the other two but has nearly linear phase over the audio band (for 88.2kHz sampling or more) or over half the audio band (for 48kHz or less).

About these filters

From listening to back-to-back AD/DA conversions of analogue sources it is our experience that the only filters capable of passing a signal without audibly changing it are linear-phase. Yes: that is the kind with a ringing tail both before and after the impulse. This may be counterintuitive but any other type always adds some form of colouration, often pleasant sounding but always noticeable and hence not true to the original. A new fad are minimum phase filters. Those in essence mimic the behaviour of the filters used in most pre-1985 digital equipment (!!). Advocates like them because they do not pre-ring. This is true of course but it isn't the only difference. Minimum-phase filters introduce frequency dependent delay throughout the audio range and usually their architecture is different too. This makes it doubtful if advocates have taken steps to insure that only the phase response of the filters they were comparing was changed. And at any rate the point is moot because none of the tests purporting to establish the superiority of minimum phase filters actually compared the output with the original unfiltered signal to see how much the sound changed. All simply compared two differently filtered signals and made a subjective call as to which listeners felt sounded most flattering.

It is distressing how much of the audio canon was evaluated and “proven” solely by comparing two output signals and how rarely anyone bothers to do a straight listening comparison between output and input signals. Only such a test can truly tell transparency from euphonic colouration.

Troubleshooting

Most difficulties in audio systems are the result of incorrect connections, or improper control settings. If you encounter problems, isolate the area of the difficulty, check the control settings, determine the cause of the fault and make the necessary changes. If you are unable to get sound from your preamplifier or its behaviour is not as expected, refer to the suggestions for the following conditions:

No response when pushing buttons: Verify the mains connection. Unplug the power cable from the preamp and try to power another device with it. If this works, check the fuse. Lever out the little drawer underneath the mains input and replace the fuse that's hooked into the end of it. The second fuse that you see in a separate cavity of the fuse drawer is a spare. If this still doesn't work, contact your local retailer. The unit may need repair. **If you have obtained the unit overseas**, refer to the section on AC Power Input. The unit may have a supply voltage lock programmed in as a grey-market prevention measure. Again, consult with your local retailer.

The unit responds (as witnessed by lights and clicking relays) **but no sound**: Verify that the toggle switch on the input is correctly set (RCA or XLR). If you have chosen to override it using the mobile app, verify the setting. Insure that the source is connected to the selected input. This may have been re-routed using the mobile app. Verify any such switches on your power amplifier too (and make sure it's on and wired correctly). When in complete doubt, restore the factory preset by holding down the middle two buttons for more than one second. Note though that this erases any programming you may have done, including phono settings.

Loud and distorted sound even at low volume settings: a line level source is routed through the phono stage. Connect the source to another input or reconfigure the input as a line input using the mobile app.

The volume control has no effect and the power LED is off although one of the channel LEDs is on: you've selected a preset that's programmed as Direct. If indeed you have a volume controlled device like an A/V receiver connected, this is the intended behaviour and you may have simply selected this preset by accident. If you have no volume controlled source, reprogram this preset as a normal input before you continue using the product.

Audio performance data

Item	Symbol	Min	Typ	Max	Unit	Notes
Input level	Vin			20	dBu	(7.75 Vrms)
Output level	Vout			20	dBu	
Input impedance	Zin		100k		Ohm	
Output Impedance	Zout			44	Ohm	
Noise voltage	Vn		1.9μ		V	Unweighted at unity gain
Gain range		-70		15	dB	
Gain resolution			0.2*	1	dB	*better than 0.2 dB over normal listening range
Bandwidth	Fc	200k			Hz	
Distortion (THD, IMD)	THD IMD			-150	dB	Not measurable using current test equipment, number is an estimate based on performance of the discrete gain block at maximum signal level

Table 3: Audio Performance Data

Technical data

Item	Value	Notes
Supply voltage	90-135 / 180 – 270 Volt AC/47-63Hz	Auto Switching
Power Consumption	20 Watt	
Dimensions	435mm*110mm*340mm	(W x H x D)
Weight	18 kg	

Table 4: Technical Data

Annex I: RC5 Codes

The Device Code is 16.

Command	Primary Code	Alternative Code
Mute	12	53
Volume Up	16	51
Volume Down	17	52
Presets 1…6	1…6	
Power on/off		50
Next Source		54
Previous source		55

Table 5: RC5 Codes

10 consecutive repeats (no change in the T bit, i.e. holding the button depressed) of Mute or 1…6 powers the device down.

Annex II: Serial Commands

Connection

The Bluetooth interface implements an SPP link. The DB9 connector is RS232 fixed at 9600 baud, 8 data bits, 1 stop bit, no parity. If a DAC is fitted, a serial port will appear when USB is connected. All three can operate the preamplifier independently and concurrently (whatever that might be good for). No echo is given. End-of-line is CR. LF is ignored. Commands are not case sensitive.

Command Format

To change a setting, issue @<command><value><CR>. E.g.:

```
@vol-15.3
```

…tells the preamp to set the volume to -15.3dB. The volume knob will rotate until it gets to this value. There is no reply.

Asking what the current volume state is, is done by issuing ?<command><CR>. For instance sending:

```
?vol
```

…will result in a reply like

```
!VOL-15.3
```

Command list

All commands are read (?) and write (@), with the exception of those already marked as ?.

Command	Parameters	Function
FRZ	1 or 0	Freeze (1) or thaw (0). Freeze mode is useful to store a lot of new settings in one go without physically changing anything until thawed.
VOL	-99.9 to 16.9	Volume
PRE	0 to 5	Select preset
BAL	-127 to 127	Balance. -127 is fully left, +127 is fully right, 0 is centered
POW	1 or 0	Power on (1) or standby (0). Note: access to other settings is not guaranteed in standby mode.

THI	-7 to 7	Treble. 0 = flat
TLO	-7 to 7	Bass, 0 = flat
TGL	1 or 0	Store tone setting in preset (0) or globally (1)
SRC	0 to 5	Source selection. 0-4 is rear panel, 5 is DAC
GAI	-8 to 8	Gain offset (dB)
UNB	0, 1 or 2	XLR/RCA input. 0=as set by toggle switch, 1=XLR, 2=RCA.
INS	0 or 1	Phono (1) or line (0) input
MUT	0 or 1	Mute
PHL	0 or 1	Invert left channel phase
PHR	0 or 1	Invert right channel phase
SUM	0 or 1	Mono sum
DIR	0 or 1	Normal (0) or Direct (1) mode
TR1	0 or 1	Trigger output 1
TR2	0 or 1	Trigger output 2
TR3	0 or 1	Trigger output 3
TR4	0 or 1	Trigger output 4
CAR	0 or 1	MM (0) or MC (1) cartridge
RES	0 to 7	Load resistance selection
CAP	0 to 7	Load capacitance selection
PGA	0 to 7	Sensitivity (5dB steps)
PRO	0 to 3	Rolloff
RSH	0 to 2	Low Shelf
PTO	0 to 5	Bass turnover
DSO	0 to 2	RCA, AES or USB input
DFI	0 to 2	Linear phase (0), Minimum phase (1) or Optimized Phase (2) reconstruction filter
?DAC	0 or 1	1 if a DAC is fitted
?PHN	0 or 1	1 if a phono stage is fitted
?TCT	0 or 1	1 if a tone control is fitted
?FMT	0 or 1	0, PCM (0) or DSD (1) input. Note: DXD is 352.8kHz PCM.
?FSF	0 or 1	Base rate 44.1kHz (0) or 48kHz (1).
?FSM	1 - 8	Multiply base rate with 2 ^ FSM to obtain the input sampling rate
RC5	0 to 32	Change RC5 device address
?HWV		Hardware version
?FWV		Firmware version

Revision History

Revision	Description	Date
R0	Initial draft	29-5-2013
R1	Revised and expanded	20-5-2014
R2	Added app screenshots	3-9-2014
R3	Added option checkboxes	28-10-2014
R4	Updated standard remote and screenshots	11-9-2015