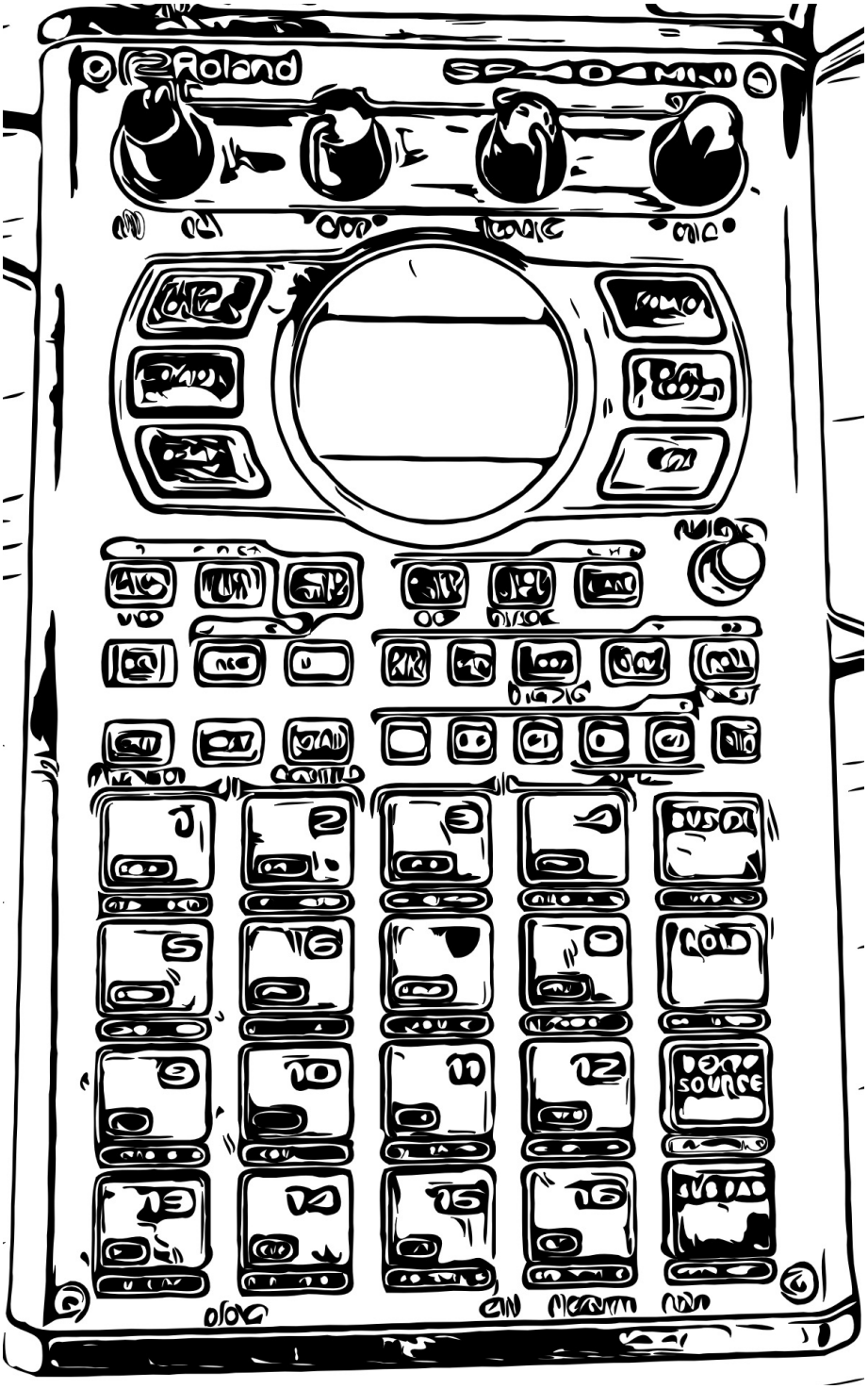
NearTao's Guide to SP-404 mk2

An Unofficial Reference for Firmware 1.13



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Guide Versions

Guide Version	Mk2 Firmware Version	Change Date	Notes
0.8	1.13	Jan 11, 2022	Mic/Guitar Experiment, added phono subsection, made Inputs a top level section separate from Sampling, Power section USB-C info/bugs, and battery bugs, added References, fixing nits where possible
0.7	1.13	Jan 10, 2022	Gain Staging to a point, attempt at some guitar info, experiment for digital clipping,
0.6	1.13	Jan 9, 2022	Sampling stubbed Gain Staging, filled out Controls, started MIC/GUITAR
0.5b	1.13	Jan 8, 2022	Reworking sections (Specificaitions/Sampling)
0.5a	1.13	Jan 8, 2022	Added links/contact info into the Overview section
0.5	1.13	Jan 8, 2022	Finish Spec section, add some contact info, decided to put this out there as a free guide
0.4	1.13	Jan 7, 2022	Move Getting Started to the top, tweak formatting
0.3	1.13	Jan 6, 2022	Flesh out Getting Started/Conventions, and add icons, fill out Specifications section.
0.2	1.13	Jan 6, 2022	Add title page, start Overview/Getting Started
0.1	1.13	Jan 5, 2022	Initial Document Structure and Outline saved

Foreward

My man… he do be jiggling.

Contents

Getting Started

You've got this book in your hand, a tablet, or loaded up on your computer, and are wondering how in the world you can get around. Well, the order of sections is somewhat arbitrary, so while I tried to put it together in a way that made the most sense to me, you should absolutely feel comfortable going through it in whatever way makes the most sense for you. Skip through sections, consult what you're interested in now, and come back for the rest later.

To keep things simple, I am creating a dedicated URL on my website, starting a thread on SP-Forums, and using my discord server.

NearTao Blog: https://neartao.com
NearTao Guidebook URL: https://neartao.wordpress.com/neartaos-guide-to-the-sp404-mk2/
SP-Forums URL: https://sp-forums.com/viewtopic.php?f=24&t=27232
Discord Server URL: https://discord.gg/qMuSpuxC4n

This guy will show up from time to time to remind me I have a lot more work to do writing this book. Such as
* How to get updates
* How to notify people of changes
* Where more content will go
* And much much more…

Conventions

The SP-404 mk2 has a lot to keep track of, so I wanted to come up with some consistent conventions for giving directions to operate it. This should help improve the clarity to navigate this device, which while it isn't terribly complicated, does have a decent enough set of controls that I want to have a quick short hand for us to be able to work together. I'll provide pictures where it feels appropriate, but I don't want to over burden this book, and the editing of it going forward with lots of images.

Icons

Throughout this book I will try to remember to use standardized icons to help present important information and warnings as they make sense to note and identify.

Warning: I will use this icon to indicate a brief section as a warning or heads up. This section will contain details that may not be well documented or are not well understood. This will typically indicate something to be aware of on the mk2.

Information: I will use this icon to indicate a brief informative section. This will be something that is nice to know, but may not be essential for the operation of your SP-404 mk2.

Under Construction: this indicates that a section is still being considered, researched, or in the process of being rewritten. Don't be surprised if this information changes, moves, or is just removed.

Experiment: This is indicating that I have (or possibly intend) to run an experiment to get more details on how something works, or more specific information about the operations of the mk2.

Workflow: Indicates a short list of buttons presses or other things necessary to get a desired result

Bug: Indicates that there's something that probably isn't working quite right, not as documented, or not as expected. This is something I would expect Roland to fix on the mk2 eventually.

Controls

(VOLUME|CTRL1-3 CW|CTRL1-3 CCW) will all be referenced within parenthesis ( )
* Where CW is turn the knob clockwise
* Where CCW is turn the knob counter clockwise

/FX/ will all be referenced within forward slashes / /

|BUTTON| will all be referenced within pipes | |

{VALUE CW|VALUE CCW|ENTER} will all be referenced within curly braces { }
* Where CW is turn VALUE clockwise
* Where CCW is turn VALUE counter clockwise
* Where ENTER is push VALUE

[Pad 1-16|SUB PAD] will all be referenced within brackets [ ]
* These are velocity sensitive pads that can be effect volume based on how hard they are hit

<AUDIO OUTPUT> will all be referenced within < >
* Headphone Jacks
* L/Mono and R

>AUDIO INPUT< will all be referenced within > <
* L/Mono and R
* Mic/Guitar

Mic/Guitar & Power Switch?
Mic/Guitar Gain knob?
USB-C port?

`SUB FUNCTION` will all be referenced within back ticks ` `
* This will be used to typically denote functions accessed by hitting a pad/button twice, or pressing pads/buttons at the same time.

-> will denote pressing one pad or button followed by pressing another pad or button

+ will denote holding a pad or button while holding another pad or button

Examples

`CHROMATIC` |Shift|+[Pad 4] - Hold the Shift button and then press Pad 4 to enter Chromatic Mode

`F` |A|->|A| - Press the A Bank button twice to enter the F bank (honestly, don't do this one)

More examples like REC or… ???

Overview

I don't know about you, but I like guides. The *Hitch Hiker's Guide to the Galaxy* and *Zen and the Art of Motorcycle Maintenance* meant a lot to me growing up and I have read both books multiple times. Although I highly doubt that this book will have the level of social influence either of those books have had, I do hope that this book can help drive people to getting the most out of their Roland SP-404 mk2.

Let's also be honest, website documentation is a bummer, as it makes it nearly impossible to use in any offline manner. I tried looking around to see if anybody had been writing documentation for the mk2, and while I did find somebody tried to put together a pdf book from the Roland website manual content, it really wasn't what I was looking for. It's not easy to search, and the documentation is pretty bare bones. If you know what you're doing with an instrument and sampling in particular it's useful, but I can only imagine what people thing who haven't had any experience with either.

To rectify the situation, I have decide to write up this book with the following goals.
* Give a solid overview of what the mk2 is and is not
* Show users how to use the mk2 and point out common pitfalls and mistakes
* Provide guidance and workflows to help make mk2 users get the most out of their instrument
* Reference external information where possible for users to do their own further research

Similarly there are a few things I am not trying to do with this book.
* Replace the existing Roland manual

Company

Maybe add some company information?

History

*Brief history of SP series
*Famous artists/producers
*YouTube artists
*Comparison to other SPs

Specifications

Get ready, this is all of the information from the data sheet, with notes that I have sprinkled around, as well as additional information for context. There are some things I am not entirely sure about, especially for specific language that Roland has chosen to use, or how ranges for some things are managed when driven externally from the mk2. As I get more documented I'll work out some experiments, tests, or do further research and reference back into the manual, community, or anywhere else to try and nail down this information.

Sampling

Polyphony

The mk2 is specified as having a maximum polyphony of 32 voices, but doesn't state whether each voice is monophonic or stereo. (??? from what I have read/seen… need to read the manual again, or run an experiment.

Document an experiment and save off a project for readers to follow along with how we figure out if this is mono or poly.

Guess is that a voice is stereo… and 32 note stereo polyphony is pretty good.

Internal Data

Internally the mk2 appears to handle all samples at a 48kHz sample frequency at a 16-bit linear depth. It is unclear what the file format is for other metadata other than the boot screen(s) which are saved as bump map(sp?) files.

Exporting a project creates many files, but samples are saved as .SMP, and patterns are saved as .BIN. Pictures are saved as .BMP (or bump map(sp?) files), and last but not least there is a PADCONF.BIN file, that presumably contains pad settings for the project.

Could be worth digging into these file formats and seeing what can changed/ modified. Seems like a future set of experiments to run.

Sample Import Format

The mk2 natively supports importing .WAV, .AIFF, and .MP3 files. It is unclear if there are sample rate, bit depth, or other factors that are important to know when importing samples into the mk2.

Seems like some good experiments out there to try different .WAV formats, stereo vs mono (or surround sound), different bit depths and sample rates… could be cool, or might be super messy outside of “standard” values.

Using the Roland Cloud SP-404 mk2 App allows you to import WAV, AIFF, MP3, FLAC, M4A files. Maybe anything else? Could be worth researching…

Sample Export Format

The mk2 only exports files as stereo, 16-bit, 48khz .WAV files.

Warning: Plenty of older devices only support 16-bit at 44.1khz. The older devices may happily play a 48khz file, but it will be out of tune because it will be playing at a different speed than the intended 48khz that the mk2 exports.

Skip Back

The skip back features allows the mk2 to record the last 25 seconds of audio from the final output mix (??? What does Roland refer to this as) into a buffer that the user can access to go back to.

The skip back certainly makes the mk2 an interesting end of chain device as it can let you capture snippets of a performance that you may not have been intentionally recording, but if you’re fast enough and want to revisit again to try to recreate or to sample for future use. Over time I think we’ll see this as a formative mk2 feature.

Storage

Data

Internally, the mk2 can store up to 16 projects, each project is made up of 10 banks, and each bank can have both 16 samples and 16 patterns. Some basic math lets us know that internally the mk2 can store up to 2,650 samples and 2,650 patterns (16 samples/patterns * 10 banks x 16 projects).

??? Are samples internally stored in the RDAC format ???

Internal Storage

The mk2 has 16GB of internal storage. From a factory install, only 14.3GB (??? From memory, need to verify) of internal storage is available, and the lost storage is due to preloaded samples and patterns, settings data, other metadata, and drive format.

Document what the maximum amount of free internal storage is when removing factoring install data.

External Storage

The mk2 supports up to a 32GB SDHC card. While it might support the older SD card format that went up to 4GB, it definitely does not support SDXC cards or sizes over 32GB.

Unlike previous SP devices (202/303/404), the mk2 does not support streaming audio off of the SD Card. It can only be used for backups/restoring data, and importing/export projects and samples.

Maximum Sample Time

The mk2 can have a single sample that is up to 16 minutes long, documented as approximately 185MB per sample. (??? can we get an exact number/amount here?)

Pattern Sequencer

The Pattern Sequencer has a resolution of 480 parts per quarter note, which is quite good. Some devices do go to 960 parts per quarter note or possibly higher, but there was plenty of gear manufactured that only manages 96 parts per quarter note.

To increase the resolution for parts per quarter note, you can look into doubling the BPM that you record at. If you were originally going to record a piece at 100 BPM, recording at 200 BPM will effectively get you 960 parts per quarter note.

The Pattern Sequencer can record patterns of 1, 2, 4, 8, 16, 32, or 64 bars.

A technique for older gear to extend the pattern length (at the expense of parts per quarter note) is to halve your BPM, which will allow you to double the number of bars you record. By doing this you can go from 64 bars to 128 bars.

The Pattern Sequencer has a BPM range from 40 to 200.

Not entirely sure how it handles ranges outside of this from an external sync source. Worth investigating.

Finally the Pattern Sequencer supports Quantization and you can apply Strength.

Got quite a few questions here… but going to need some time to experiment, read docs, and better understand how this works.

Effects

The information on the tin states that there are 37 Multi Effects that can be used on the Bus FX or EFX (what the heck does this stand for?). There are a further 16 Input Effects, which mostly seem to overlap with the Multi-effects (will need to verify parameters, but there are 3 unique input effects at this time of Auto Pitch, Vocoder, Gt Amp Sim.

To me, this reads like the mk2 actually has 40 effects at this time. I suspect that the 3 unique Input Effects will eventually make it into the MFX section, and Roland has hinted that there are likely more MFX coming, so maybe we'll get an extra page or two in the MFX section. Only time will tell.

Interface

Pads

There are two firsts for the mk2 compared to the SP 202/303/404 product line. First and most noticeably there are now 16 pads instead of 8 (as the 202/303) or 12 (as the 404/404sx/404a). Second, the 16 Pads and Sub Pad are now velocity sensitive, which means that you'll be able to vary how loud a sample plays based on how hard you hit the pads.

Control Knobs

The mk2 has continued the 4 knob tradition since the 303, and has retained it's volume knob, and three CTRL knobs. These knobs are rotary knobs and have a clear start point and end point. This means that the knobs all have a definitive position and value based on where you have the knob set. You can somewhat adjust this behavior in your settings to allow for a more relative feel until the knob value catches up with the parameter value that you are controlling.

Value Knob

Finally the mk2 has added an endless/continuous knob that has a push toggle, to allow for relative input as well as an additional commit/enter command. This means that you can endlessly turn the knob clockwise or counter clockwise and it will adjust the specified parameter based on what the software settings the value knob is currently associated with.

My biggest concern for the mk2 currently is the rotary knob. It gets used very frequently, and is something I expect have issues in the future. If you're going to travel make sure that you don't jam the mk2 into a crowded backpack, or bring a separate custom purpose case to help protect your device.

Display

The mk2 has an OLED graphical display now, which although it is not high resolution by any means, is more than sufficient to display audio data, settings, options, and plenty of other information that makes than mk2 easier to work with than its predecessors.

External Connections

There are a number of connections for the mk2, and I'll do my best to break everything down.

Headphone Jacks

Yes you read that right, the mk2 has multiple (well okay 2) headphone jacks. It has both 1/4" and 1/8" headphone jacks, which is pretty handy for using different headphone types, and might be a good way to collaborate with other people with a single device.

Need to dig into any use cases or collaboration options. Does the mk2 amplify both signals, does one get cut off? Easy to test/check, but need to look into it. I can imagine a few interesting use cases with an iPad/mk2 hooked up together as well.

A word of warning on the headphones, the **(VOLUME)** knob controls both the main outputs and the headphones, so you cannot control this independently. What makes this problematic is that the mk2's USB-C output is also tied to the **(VOLUME)** knob, and is lower than the output for the main/headphone output.

Stereo Output

Interestingly the mk2 has impedance balanced 1/4" TRS L/Mono & R jacks. This gives the mk2 some advantages to reduce the noise floor and eliminate ground loop noises when using the right cables within an impedance balanced studio environment.

The above said, I'm not sure how much this will help the average producer, as they are unlikely to be in a balanced environment, but I guess it is to say that it is a nice feature to have when you can take advantage of it.

Stereo Input

Sadly the 1/4" L/Mono & R jacks are the TS (no ring to provide impedance balance) type and appear to not be balanced.

Personally this doesn't bother me too much, but it is a little bit strange to see balanced outputs and unbalanced inputs. It's probably fine, but if you find running off of batteries or USB adds some noise, try using DC power.

Dual Microphone/Guitar Input

On the front there is dual microphone and guitar jack that is a 1/4" TRS. For a guitar the ring isn't doing anything, so just use a standard TS cable to hook up your guitar and/or pedals. For microphones you'll need a TRS cable, as this is how power is provided to the microphone.

I'm not sure what types of microphones the mk2 supports, going to need to do some research to figure this out.

MIDI Input and Output

The mk2 supports MIDI in and out, using 1/8" TRS jacks. You can buy these cables from Roland as accessories. For supported devices you should be able to connect TRS MIDI out to TRS MIDI in across devices.

Roland lists some optional (not included in the box) accessory cables that you can buy, and I'll dig more into the specifications of them later.

BMIDI-5-35
BMIDI-1-35
BMIDI-2-35
BCC-1-3535
BCC-2-3535

There are two TRS cable formats for TRS to MIDI, make sure you get the right format documented here.

It appears that Boss (and Roland???) use Type A TRS to MIDI Cables.

USB-C Connection

The mk2 has a USB-C port. It can be used for powering the device, sending and receiving MIDI information, and sending and receiving audio information. It has a lot of utility and I'll be writing about this extensively in sections to come.

As far as I can tell, this is class compliant audio and class compliant midi. This means that you shouldn't need any special drivers to use the mk2 with devices that support class compliant audio and midi.

One oddity with the USB-C connection is that audio seems to be quieter over this connection for some reason. It seems like Roland put in a -12 or -24db (??? Measure) audio level adjustment, making you have to normalize audio to get it back up to a higher level with other content sampled on the mk2.

Power

You can power your mk2 using several options, including the provided AC adaptor, USB-C, or with batteries.

AC Power

The mk2 takes DC power in at the terminal. The power adaptor for the mk2 is an AC (wall wart) adaptor and is specified as a 5.7 volt and 2 amp device, and is center negative. It is noted that the mk2 draws 1.1 amps of power, so the 2 amps from the power adaptor is more than sufficient to handle the power requirements of the mk2.

Older SP models were 9v, and you could swap out power supplies with other SPs or even guitar pedals. This is no longer the case, so make sure when power your mk2 that you use the provided power or something with the same specifications.

USB-C Power

The mk2 can be powered from another USB-C device or power adaptor. This can be helpful if you have a lot of USB-C devices to power or charge, and don't want to carry multiple different power adaptors around with you. One thing to note however, if you are powering over USB-C, the device or adaptor must provide 1.5 amps of power, or the mk2 will default to a different type of power. The older USB standards only provided 500ma of power, and would certainly be insufficient to power the mk2.

My iPad mini has a USB-C port, and it has been able to power my mk2 without any problems. This has been helpful in conserving battery power on the mk2, but does put a bit more strain on the iPad's power supply.

Although you can hook up your iPhone to the mk2, it is unable to supply the necessary 1.5 amps of power over the port. This is fine if the mk2 is plugged in, but if you are battery powered on the mk2, then you are going to get consistent messages about the mk2 using battery power.

I'll get into it more later, but I have found you need a USB-C to USB-C cable to power the mk2 over USB. There are some issues of using USB-C to Lightning or USB-C to other USB cable types. Yes it works for information, but not power.

Battery Power

To power the mk2 off of battery power, you will need 6 Alkaline or Ni-MH batteries. There doesn't seem to be a way to tell the mk2 what type of batteries you have inserted like some other devices do. Roland specifies that for Alkaline batteries you will get approximately 2.5 hours of use and for Ni-MH batteries you will get about 3.5 hours of usage. If you use rechargeable batteries you can likely expect the amount of time you get between recharges to be lower, but you'll go through less batteries.

I just wanted to note, that it's not a great habit to get into leaving batteries in the mk2 for months or years without checking on them or replacing them. If you're not using the mk2 for extended periods of time consider taking the batteries out in case they leak so that they don't ruin your device.

The mk2 doesn't give any information to let you know about remaining battery power while in the interface. Although a power loss from no longer having remaining battery life may not be the worst, it can still lead to a loss of work or other issues. The mk2 really should have some sub menu to indicated battery life.

SP-404SX/A Project Import

The mk2 is able to import projects from the 404SX and 404A.

I don't have either of these units, so not able to test or try this out at this time. I believe that this needs the Roland cloud app, and not able to be done over the sd card on the mk2.

Data (Types of Data? Structure?)

The SP-404 mk2 has several types of concepts and data that you will want to make sure you understand while you are working with your mk2. This will help ensure that you are managing your mk2 data appropriately.

Draw a picture of Backup/Restore -> Projects -> Banks -> Samples/Patterns???

System Backup/Restore

Backing up your SP-404 mk2 will create a directory structure on your SD Card that contains all of your Settings, Projects, Banks, Samples, and Patterns in one easily referenced place.

Settings

When you enter **“UTILITY" |SHIFT|+[PAD 13]** you can get to all of your settings for how your SP-404 mk2 will operate. The UTILITY MENU allows you to make SYSTEM changes, PAD SET changes, EFX SET changes, IMPORT (and export) Projects and Samples, BACKUP, and FACTORY reset.

Turning **{VALUE}** will allow you to select which UTILITY MENU you would like to access, and pressing **{ENTER}** will allow you to enter the specific UTILITY MENU that you have selected.

By turning **(CTRL3)** you will be able to scroll through settings for GENERAL, CLICK, MIDI, GAIN, and VERSION.

These settings will effect the overall operation of your SP-404 mk2.

Does this change… project to project… saved with a backup/restore? Experiment to find out!

Projects

A project is the highest level of data that makes up the SP-404 mk2 workflow. Projects contain Banks, Samples, and Patterns within them

Banks

Banks contain Samples and Patterns, and both of these banks can be independent of the other.

Each Bank can contain 16 Samples and 16 Patterns.

Need info on **|SHIFT|+|BANK|** for Bank Volume Settings. Kind of straight forward I guess… but still.

Samples

So is this section just talking about sample data, or also get a bit into the sampling workflow? No need to repeat the Specifications “sampling section” so… gotta think

Patterns

Similar to samples… I don’t think this section is a full on breakdown of patterns, but need to sleep on it.

Inputs

Of the many ways that you may choose to utilize your mk2, probably the most consistent thing that you're likely to do will be to sample from an external source. This section will cover the different types of input, and how you may go about utilizing them within the mk2 and your other devices.

One thing to note about the inputs on the mk2, if you have EXT SOURCE on, or are in REC mode, it will pass through anything on the inputs from the 1/4" ins, MIC/GUITAR, and USB-C. This is good if you want this, but could be problematic as there is no way to switch between the 3 input sources individually if you wanted to.

MIC/GUITAR Input

On the front of the SP-404 mk2 there is a 1/4" TRS jack that can be used to (power/increase signal strength) of a guitar or a microphone. There is a switch labelled MIC/GUITAR, and a GAIN knob that can be turned to adjust the incoming signal boost.

I ran some experiments on over driving a line level signal on the mk2, and there doesn't appear to be anything special about running line level audio into the MIC/GUITAR input, if EXT SOURCE is turning red, then you are definitely digitally clipping your audio.

Microphone

When the MIC/GUITAR switch on the front of the mk2 is set to MIC, you can connect an unpowered microphone to the front INPUT jack.

Just discussing microphones would require a guide on its own, and overall is far too deep of a topic for this section. In this section I will just hit the most important notes.

The mk2 doesn't have a phantom power switch that would enable it to provide power to microphones that require it. As such, this means that you won't be able to directly use a condenser microphone without having a DI box or amplifier that you can plug the microphone into, and then hook that up to the mk2.

If you want to use a microphone with your mk2 then, you are going to want to be looking for dynamic microphones as they do not require power. Dynamic microphones tend to be lower cost, but the transient response and high frequency response tends to be lower than that of a condenser microphone.

Shure makes the SM57 and SM58 which are both solid dynamic microphone choices found on stage and in studios, and I have been using an AKG D880 for years that has worked just fine for capturing a multitude of audio options.

If you really need a condenser microphone, I might suggest looking into the Zoom product line. I have the Zoom H6, it is a small field recorder, supports up to six inputs, and can provide phantom power to microphones, as well as allowing you to record endless amounts of content on its own.

The manual does not make it clear what types of microphones are supported on the mk2, but since there is no phantom power switch, and the manual does not

state that it can provide +12/+24/+48v phantom power I must assume that it cannot. Condenser mics will need power from batteries or another device.

On some older sampling gear a trick was to hook up your line outputs to the microphone inputs to add some distortion. This worked due to the the nature of the AD used. Unfortunately this old school trick doesn't seem to work as you just get the traditional digital clipping instead of getting any interesting distortions.

Guitar

When the MIC/GUITAR switch on the front of the mk2 is set to GUITAR, you can connect high impedance devices like a guitar or bass, as well as guitar pedals if you wanted to add one or more pedal effects to your guitar or bass.

Instrument level brings it's own challenges with noise. I don't have a lot of guitars to choose from (just the 3 string my dad made me)… may need some help beyond doing pedal stuff for thoughts/suggestions here. Hooked it up, and holy smokes is my 3 string noisy… woof. Guess will need to come back here later.

Tried a few things… noise floor straight from a single pedal into the mk2 is *high*, and I'm suspecting it might be a noisy power supply. I switched over to my pedal board and it so far sounds much cleaner, if noisy. I suppose a hold off on this section for the time being is in order, but even for just testing, got some fun results.

The mk2 doesn't have an inbuilt tuner, so if you're trying to tune your guitar or bass you'll need to look elsewhere. There are plenty of good phone apps and battery powered tuners. This is a feature I'm hoping we get in the mk2 at some point though, so we can tune instruments, samples, or whatever else needs tuning.

Line Level Input

For a lot of people, I expect that the 1/4" inputs on the back are going to be the primary way to get sound into their mk2. Plenty of instruments, radios, phones, tablets, and more output audio at line level.

How to reduce noise floor, EXT Settings, …

Phono Level Input

Before I dig into this section it must be noted, that the mk2 does not by itself support phono level on its inputs. While you can technically connect phono level up to the line level input jacks on the mk2, it is going to be incredibly quiet, and the audio will almost certainly have some distorted qualities to it.

Also, just because you have a device with RCA/Phono jacks doesn't mean that your device outputs at phono level, it may be outputting line level. You'll want to make sure you know what the specifications are for the outputs.

That said, most turn tables will output at phono level, and need to have their signal boosted up to line level. This is traditionally done through amplifiers, and is why you will see many people who sample off of vinyl will have a DJ style mixer as part of their setup, which does the job of signal amplification, volume control through the track fader and cross fader, signal equalization, and may even have some other effects.

USB

Need to go over the feature a bit, I suspect a number of people are going to sleep on this, and something as simple as a phone can really do some cool stuff here.

Gain Staging

When people talk about gain staging, what is generally meant is to have all of your inputs at an equal input signal to each other. This is particularly important in studios with large mixers, because you want to use your mixing console as the master volume control for each audio channel, otherwise you quickly find that each instrument has a varying amount of volume and noise floor, and this leads to making it harder to mix.

Traditionally, for many audio sources, you would run a single sin wave as output for each source, at or near the maximum instrument/device volume without the signal distorting, and then adjust the input gain on the mixer until you hit a target volume such as 0db or -3db for each and every device/instrument. By doing this, you will be maximizing the amount of volume you have the instrument, and in general this will also help to reduce your noise floor. This allows each fader on the mixing desk to be able to control the volume of any sound relative to any other sound.

Now there are a couple things to consider here, first, the mk2 doesn't have any mixer faders, and second most of the volume gain you can do on the mk2 is done in software.

Going to have to come back to this section… I really need to figure out what the threshold is that is triggering the EXT SOURCE pad to light up red.

EXT SOURCE Controls

Monitor External Sources

When sampling, it is not always necessary to monitor your external sources, but if you don't want to enter record mode, and just want to hear how things will sound, if the sound is too loud or quiet, or if you are getting some kind of clipping or distortion this can be a quick way to hear how your source is sounding. To monitor your mk2 inputs, all you need to do is press **|EXT SOURCE|** and play your audio from your external device.

The experiment **Does EXT SOURCE turning red mean that you are clipping or not?** shows that if you see the EXT SOURCE pad turn red that you are digitally clipping. Unless you are looking for a specific or intentional effect, you should dial your audio source back down so that the EXT SOURCE pad stays amber.

Input Settings

You can adjust your input settings with **`INPUT SETTINGS` |SHIFT|+|EXT SOURCE|** which will bring up additional information on your display.

Modifier	CTRL1	CTRL2	CTRL3
None	REC BPM	ROUTING	LEVEL
SHIFT	FINE REC BPM	N/A	PAN

REC BPM (CTRL1) - This sets the BPM that you believe you are recording at in whole number increments. If you are just recording one shot samples then you probably don't need to worry about this too much, but if you are planning on using LOOP or PING-PONG you may be more interested in getting this set properly.

FINE REC BPM |SHIFT|+(CTRL1) - This allows you to adjust the REC BPM value by one tenth (or .1) value at a time instead of adjusting the BPM value by whole numbers.

ROUTING (CTRL2) - This allows you to set either Mix or ExtIn. It does not directly impact what is played, but does impact what will be recorded. If you select Mix, then when sampling all content that is playing, whether it is from pads or from an external input will be recorded. When set to ExtIn, then only audio coming in from the Line In, Microphone, Guitar, and USB-C connection will be recorded.

Although this is undoubtedly useful, I think it would be helpful to have a few extra settings so that you could have a loop playing on a pad to hold a beat or rhythm, and then for example use Chromatic mode to just record a new bass line or piano section. However, this would require additional routing that just does not exist. Pre/Post Bus?

LEVEL (CTRL3) - This adjusts the volume of the sample that will be recorded. 0 is the lowest and will be so quiet that the sound will be imperceptible, and 127 is the loudest volume you can record. If you are approaching or going beyond clipping you may see the |EXT SOURCE| light up red.

PAN |SHIFT|+(CTRL3) - Adjust the stereo pan of the incoming signal. C indicates that the signal is centered, so whatever is connected to your inputs will be reflected the same on your speakers. For either an L or R setting a value of 1 is the lowest amount of panning and a value of 50 is the highest amount. At a value of L50 you should only hear the inputs in your left ear, and a value of R50 you should only hear the inputs in your right ear.

Input FX Settings

From the INPUT SETTINGS menu, you can get to the Input FX settings through the value knob by pressing **{ENTER}** to open up the menu. This will break the display down into three sections EFX Type, EFX Settings Row 1, EFX Settings Row 2.

To modify EFX Type when the row is underlined press **{ENTER}** and then rotate **{VALUE}**. To exit modify the EFX Type just press **{ENTER}** again once you are happy with your selection.

To modify EFX Settings Row 1 and EFX Settings Row 2, you only need to rotate **{VALUE}** to underline the row that you want to modify and then use the corresponding **(CTRL)** knob to change the EFX setting's value on that row.

By default the EFX Type will be set to Bypass, which indicates that the incoming signal is clean. There are sixteen EFX that you can select from here, three of which only appear in the Input FX menu.

Unique FX to Input FX - Auto Pitch, Vocoder, Gt Amp Sim.

Common FX to Input FX - Chorus, JUNO Chorus, Reverb, TimeCtrlDly, Chromatic PS, Downer, WrmSaturator, 303 VinylSim, 404 VinylSim, Cassette Sim, Lo-fi, Equalizer, Compressor.

For more details on the individual effects, please see the Effects section.

Sampling

Record Controls

Recording

To record a sample is as simple as pressing |REC| when in sample mode, then any free [PAD 1-16] to select a pad to record to, .

Deleting

Preserving (whatever it is called)

Resampling

Plenty of techniques to discuss, how it manages Bus FX and EFX (ugh this irritates me a bit with double FX). Also reduction in volume through input volume, reducing incoming audio (possible issue in other spaces with -12db setting), and overall needing to normalize *a lot*.

Skip Back

Interesting feature with a lot of potential, how to use the buffer to get good loops, experiment, and all that fun stuff.

Sample Edit

A lot of what is under the SAMPLE EDIT banner on the mk2 is geared toward what I would refer to as sample playback. To me, editing is something you do that destructively changes the characteristics of the sample, and not just changing how the device plays the sample back. Mostly a nit, but I find that it confuses the terminology for people coming from or going to a lot of other devices. At any rate, you'll find the handful of sample editing features that are destructive in the Start/End menu, everything else that you want to do to manipulate or change the actual sample itself you will have to do through Skip Back, Resampling, or offloading to other devices, which I'll go over in the appropriate sections.

To get into any of the options under the Sample Edit banner you simply need to be in Sample Mode(???) and not Pattern Mode(???), and press a pad that has a sample on it, and then

Not a whole lot to edit in the mk2, most real editing will be done with Resampling… but we've got a few things we can do that are worth learning and understanding.

Start/End

!!! Right here, just got tired of copy/pasting in the under construction icon… maybe the under construction icon everywhere is a bit much?

Start/End Value Sub Menu

Normalize

!!! Increases the maximum volume of the entire sample sample to be 0db. This is not just within start/end points.

Truncate

!!! Reduces the sample size between the start/end points. Good for saving sample time, but maybe not great if you want other parts of the sample or to adjust things later

---

Emphasis

!!! I guess this accentuates the high end… need to read up more on what it is actually doing.

Cancel

!!! Exits out of the menu

Pitch

!!! Range, effect, etc…

Pitch Value Sub Menu

BPM Value Ranges…

Chop

!!! There's plenty of cool stuff here to play with, but I still haven't gotten it to mark/chop and then assign to pads quite the way I'd like, several workflows to attempt and document for sure.

Chop Value Sub Menu

Auto Mark

Assign To Pad

Delete All Marks

Cancel

Envelope

!!! Explain how this works, and how GATE behavior is broken… hopefully a bug. Also why you'd set values a certain way to avoid clicks in the start (and maybe end) of a note.

Envelope Value Sub Menu

!!! There is none… huh…

Mark

!!! Not much to explain here under Sample Edit section… though maybe? I think it makes more sense to dedicate a section to Skip Back

Sample Mode

This whole section is under construction, just taking notes on things that come to mind that will be worth documenting.

BPM Sync

Gate

!!!

Loop

Ping-Pong

Reverse

Roll

Roll Set

* Mute Groups
* Chromatic
* Fixed/Velocity
* Cue/Monitor
* Bus

Mixer

* Diagram
* Pad Volume
* Bank Volume
* Project Volume
*

Effects

* Bus/EFX Diagram
* Bus Effects
* EFX/Settings
* Input Effects
* Customization

Patterns

DJ Mode

System/Config

Import/Export
* File Structure
* Projects
* Samples

Midi

* Each midi channel is to address each bank of a mk2 project.
* Supports velocity, but doesn't appear to have any other CC automation available.

Boss (and Roland???) use Type A TRS to Midi cables.

External Connection

* Midi - channels, controlling external gear (probably needs it's own section really)
* Phone
* Tablet
* Cassette/Turntable/FM Radio
* Computer

Integration

* Computer
  * Reason Studio
  * Ableton Live
* Guitar
  * Electric
  * Pedals
* Microphone
  * ???
* Hardware
  * Akai MPC
  * Mixer
  * Midi Interface
* Eurorack
  * Audio
  * Midi
* iPad/iPhone
*

Customization

Face Plate

Knobs

Display

SP 404 mk2 App (roland cloud?)

Sample Packs

Appendix A - SP Use Cases

* SP as a buffer
* SP as a tape recorder
* SP as an effects box
* SP as a master bus

Appendix B - Beat/Drum Patterns

Appendix C - Workbook

* Foley Loops
*

Appendix D - Finger Drumming

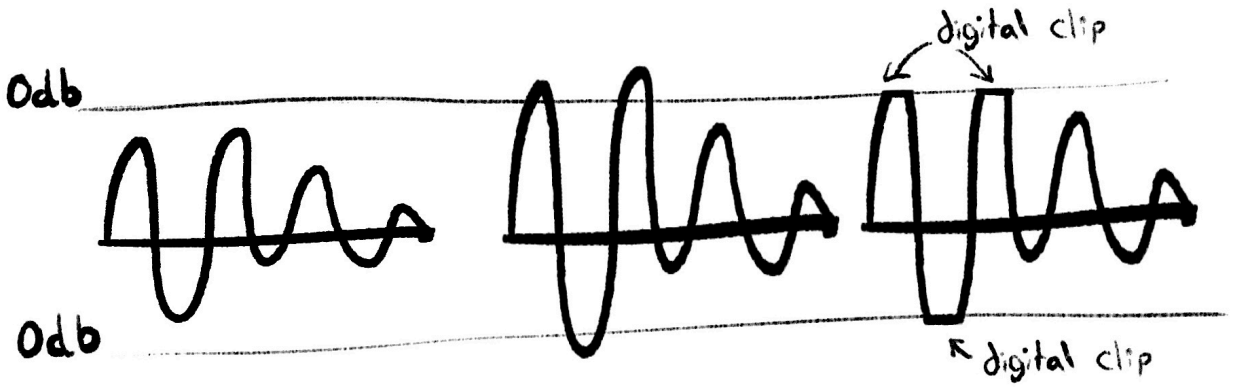
Appendix E - Experiments

Is the mk2 polyphony monophonic or stereo?

Does EXT SOURCE turning red mean that you are clipping or not?

Clipping occurs on audio devices when a signal goes over their maximum threshold. On analog devices, this can sometimes produce interesting results and new harmonics, but on most digital systems, 0db is the maximum for a sound.

Below is a sketch to illustrate what happens when a signal has been digitally clipped, and is a result of the input signal being louder than the 0db maximum. If you see flat tops to your sampled waveforms, unless you are working with square waves, then you're almost certainly experiencing some digital clipping.



Theory
I believe that the mk2 is going to digitally clip on the 1/4" inputs.

Method
I hooked up my trusty Moog Voyager to the 1/4" inputs on the mk2, and dialed the Moog in to a single oscillator with a triangle waveform. This allowed me to pretty clearly visually see if the tips of the triangle were still in tact or not when I was recording samples.

Recording #1
I dialed in the output volume from the Moog Voyager until the EXT SOURCE lit red, and then dialed it back slowly until it went back to the amber color. I then went into the sample and visually inspected the points of the triangles, and as far as I could tell everything we nice and pointy.

Recording #2
For the second recording I adjusted the Moog Voyager output volume until it was just barely triggering the EXT SOURCE to light red and stay red. This took a little bit of slight adjustments

because it takes a few seconds of not playing a note for the EXT SOURCE pad to change back to amber, but I was able to dial in the sound where it was staying right on the edge. When I looked at the second sample, I could see that the tips of the triangle waveform were starting to flatten.

As a note, the audible difference is certainly there, but it is barely imperceptible. Also, there are reasons you may want to intentionally do this to a clip as it can add some additional intentional artifacts. I wouldn't do this for a final mix myself, but as part of sound design and creative process why not have some fun?

Recording #3
The third recording I just pegged the Moog Voyager to maximum audio output. This caused some very heavy digital distortion of the audio that was instantly recognizable, and to my ears not terribly appealing unless you want everything to sound like a square waveform. Although I did not have to zoom in to hear this, once I did the damage was incredibly perceptible and it was easy to see just how much of the sound was actually left.

Conclusion
It wasn't too much of a shock to me to see digital clipping on the 1/4" inputs of the mk2, most AD convertors take the data straight in and just clip away quite happily. It is confirmed that if you see red on your EXT SOURCE pad, then you are clipping your incoming signal. Whether this is desirable or not is up to you to decide.

Does the mic/guitar input produce analog or digital distortions?

On some old school gear such as the Akai s900/s950, a common way to distort a signal and add some character was to hook up whatever you wanted to sample into the microphone jack instead of the line input. This would create an analog clipping effect that some people found musically interesting.

Theory
I believe that the mk2 is going to digitally clip on the microphone/guitar input just as it did on the line level input. Still, I think it is worth the experiment just in case this yields something interesting.

Method
I hooked up the Line Level output of my Moog Voyager to the mic/guitar input of the mk2, and set the output level of the Voyager all the way down, and the gain on the mic/guitar was set to 0, since the output from the Voyager is definitely going to be hotter than a microphone or guitar. I then setup the patch on the Voyager to output a single triangle waveform so that it would be easy to determine if there was digital distortion.

Recording #1
My first recording was with the mk2 set to microphone input, and the gain was set to 0. I slowly increased the volume output of the Voyager until the **EXT SOURCE** pad just barely turned red, and then backed it down so that the pad would stay amber. Visual inspection of the waveform showed that it was being recorded as expected with no digital distortion.

Recording #2

The second recording had the same setup as Recording #1, but I decided to increase the volume of the Voyager so that the **EXT SOURCE** would remain lit while I played a note. With this change I could immediately hear the tone of the sound change, and when I inspected the waveform I could clearly see that the audio had been digitally clipped.

Recording #3
For the third recording I set the mic/guitar switch to guitar, and immediately noticed that I had to increase the output volume of the Voyager to get the **EXT SOURCE** pad to light up red, and then back it down again to amber so that I could get my recording. Loading up the waveform on the mk2 I didn't notice any distortion or digital clipping.

Recording #4
The final recording was also set to guitar, and I increased the output volume of the Voyager so that the **EXT SOURCE** pad would light up red. I could immediately hear the distortion as it started making the triangle audio sound more like a square wave. Visual inspection showed that the signal was digitally clipped just like Recording #2.

Conclusion
It appears that both the microphone and guitar inputs digitally clip just like the line level inputs. Other than as a specific type of distortion, I don't think that people will find it useful in general to drive their signal to the point that the **EXT SOURCE** pad lights up red, and causing digital distortion.

However, with all this said, this was just me listening by ear and visually inspecting the waveforms on the mk2. Somebody who wants to devote more time, and go use graphic equalizers or other techniques may find that there is some additional magic that I was unable to determine.

Appendix F - System Comparison

Not sure if this is interesting for folks or not… and this list could grow forever… if I get to it this section should probably move *way* down, maybe into an appendix?

Akai MPC Live/X/One
Boss SP-202
Boss SP-303
Boss SP-404
Boss SP-404(SX/A)
PO-33
Blackbox 1010

???
SP-404 (2005) - Sampling frequency 44.1 Signal processing 24 bits
SP-404A (2007) - Sampling frequency 44.1 Signal processing 16 bits
SP-404SX (2009) - Sampling frequency 44.1 Signal processing 16 bits
SP-404MKII (2021) - Sampling frequency 44.1 Signal processing 16 bits ??? 48khz?

Appendix G - Frequently Asked Questions

When the EXT SOURCE lights up red, is my input clipping?

Yes, if you see the EXT SOURCE pad light up red, then the mk2 is digitally clipping anything that goes over the 0db threshold.

Does the SP-404 mk2 support AIRA link?

It is not referenced in the manual, so I suspect that this is a big no.

Device

Panel

Edit Section
- Volume -
- CTRL 1/Cutoff
- CTRL 2/Resonance
- CTRL 3/Drive

Control Section 1
- Filter+Drive FX
- Isolator FX
- Resonator FX
- DJFX Looper FX
- Delay FX
- MFX
- Display

Control Section 2
- (Pattern Sequencer)
- Pattern Select
- Pattern Edit
- (Sampling)
- Del
- Rec
- Resample
- Exit (Pattern Stop)
- Copy
- Remain (Current Pad)

Control Section 3
- (Sample Edit)
- Start/End (Chop)
- Pitch/Speed (Envelope)
- Mark
- (Push Enter)
- Value Knob
- (Sample Mode)
- BPM Sync
- Gate
- Loop
- Reverse
- Roll (Roll Set)
- (Bank)
- A/F
- B/G
- C/H
- D/I
- E/J
- Shift

Pad Section
- Pad 1 (Fixed Velocity)
- Pad 2 (16 Velocity)
- Pad 3 (Cue)
- Pad 4 (Chromatic)
- Bus FX (Mute Bus)
- Pad 5 (Exchange)
- Pad 6 (Init Param)
- Pad 7 (Pad Link)
- Pad 8 (Mute Groups)
- Hold (Pause)
- Pad 9 (Metronome)
- Pad 10 (Count-In)
- Pad 11 (Tap Tempo)
- Pad 12 (Gain)
- Ext Source (Input Settings)
- Pad 13 (Utility)
- Pad 14 (Import/Export)
- Pad 15 (Pad Settings)
- Pad 16 (EFX Settings)
- Sub Pad (Project)

|DJ Mode|
- |Ch1|
- Pad 1 (Bend+)
- Pad 2 (BPM +)
- Pad 5 (Bend-)
- Pad 6 (BPM-)
- Pad 9 (|<<)
- Pad 10 (Sync)
- Pad 13 (>/||)
- Pad 14 (Cue)
- |Ch2|
- Pad 3 (Bend+)
- Pad 4 (BPM +)
- Pad 7 (Bend-)
- Pad 8 (BPM-)
- Pad 11 (|<<)
- Pad 12 (Sync)
- Pad 15 (>/||)
- Pad 16 (Cue)

Rear
DC In
Power Switch
USB-C
1/8” TRS Midi In/Out
1/4” Line In R & L/Mono
1/4” Line Out R & L/Mono

Front
1/4” Headphone Jack
1/8” Headphone Jack
Mic/Guitar Gain Knob
Mic/Guitar Switch
1/4” Mic/Guitar Jack

Side
SD Card Slot

Bottom
Serial Number
Battery Compartment

Glossary

Polyphony - Specifies the total number of unique sounds that be played at the same time. Traditionally each note of polyphony is a monophonic (not stereo) sound, thus meaning that a stereo sound is normally considered to be two notes of polyphony. The Sp-404 mk2 is specified as having 32 notes of polyphony

Volume

CTRL (1/2/3)

MIN/MAX

Pattern

Pattern Sequencer

Sequencer

MFX

Filter

Drive

Cutoff

Resonance

Drive

Polyphony

Index

References

Roland Links

Official SP-404 mk2 Manuals

Official SP-404 mk2 Downloads (firmware and skin template)

Ultimate Guide to Customizing the SP-404 mk2

Unofficial Links

Downloadable SP-404 mk2 Manual in PDF (firmware 1.10)

Technical

https://minimidi.world - Type A and Type B TRS to Midi resource

Specifications for TRS Adaptors Adopted and Released - Link to TRS Midi Specification

Articles

Roland Engineering: Designing the SP-404 mk2

Forums

Elektronauts Roland SP-404 Mk2 Thread

Elektronauts SP-404 Mk2 Production Tips/Tricks/Problem Solving/Bugs

MPC-Forums SP-404 mk2 Thread

SP-Forums SP-404 mk2 Sub Forum

Modwiggler Roland SP 404 mk2 Thread

Gearspace Roland SP-404 mk2 Thread

Reddit SP-404 Sub

Reddit SP-404 mk2 Sub - Seems dead

Videos

Official Roland SP-404 mk2 Launch Video

Loopop SP-404 mk2 Review / 9 Tips & Ideas / Tutorial

Mike Acosta Roland SP-404 mk2 First Look

Bo Beats Roland SP-404 mk2 - the new king of creative samplers?!

Ave Mcree Roland SP-404 mk2 A Hip Hop Producer Review

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Nonjuror - Making a Beat on the Sp-404 mk2

Ski Beatz Chopping samples on Roland SP-404 mk2

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Roland SP-404 mk2 Vocal Tutorial - Soft Blue Magic

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LOFI Hip Hop jams on the SP 404 mk2 - spvidz

Roland SP-404 mk2 Overview // The Upgrade We've All Been Dreaming Of - Jade Wii

Special Thanks

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