A Basic Guide for Using MAX/MSP to Control the Buchla (200 Series)

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With help from Dr. Andrew Schloss and Colin Malloy

Before we begin (Some caveats)

All the information you find here is related to the particular devices that were used. I recommend you use this as a **general guide.** There might be fewer or more steps needed depending on what equipment you are using. The steps should remain generally the same but with a few changes or additions.

For this guide, basic familiarity with the Buchla, MIDI, MAX/MSP and the overall control room is highly recommended. Regardless, some introductions and general information will be provided for reference as well as some helpful links.
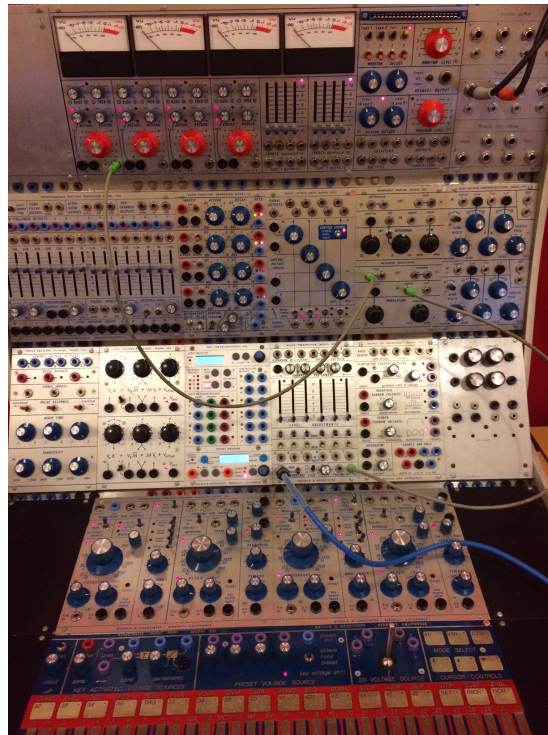
Check this list for the equipment and cables you will need.

Equipment List:

Buchla
- Banana Cables
- Patch Cables
  - Both the Banana and patch cords can be found in a blue box near the Buchla
- MIDI to to Buchla Cable

Arturia KeyStep37 (or any MIDI device of your choosing)
- USB cable

Computer with MAX/MSP installed (MAX 7 or 8 should both work)

Arturia KeyStep37

Arturia USB Cable

MIDI Cable

Introduction to MIDI

MIDI or Musical Instrument Digital Interface is a great piece of code writing that allows for quick translation of music data. MIDI will send information about a few specific points of data:

- Note on / Note Off
- Note Pitch
- Velocity
- Channel

This is the data that will be transferred from your MAX patch, to the Arturia or whatever MIDI device you choose and into the Buchla.

There are lots of interesting details about MIDI and how to use it. You don't really have to know much more than what is stated in this guide, but it can be helpful to learn more about it for future projects.

To read more about MIDI, check out these links:
https://en.wikipedia.org/wiki/MIDI
https://musicianshq.com/a-beginners-guide-to-midi/

Introduction to the Buchla

Back way back when, in the yonder years of music technology there did not exist the home computer. There did not exist DAWs or beat pads. But there did exist the hunk of metal known as the Buchla. This marvelous music box was a great provider of many beautiful sounds. I wish we had the time to get into the technology but we have to get you up and running. Modular Analogue synthesizer

The basics of the Buchla surround voltages and oscillators. The Buchla in the studio has four oscillators that are paired up in two. There are also four channels located at the top of the Bucla. The rest of Buchla is mostly modules that act as different functions to modulate the signals. You will need some cords in order to operate the machine.

PATCH CORD INFO:
SIGNAL patch cords have mini-phono (1/8") jacks; they go into the metal input jacks on the Buchla
VOLTAGE CONTROL patch cords have plastic banana plugs and go into the plastic banana jacks on the Buchla. They are color-coded as follows:
BLACK jacks are inputs (with the exception of the outputs of the DUAL VOLTAGE PROCESSOR module, and the joystick).
BLUE or **PURPLE** jacks are OUTPUTS. Purple = pressure.
RED jacks are for pulses, and are labeled as inputs or outputs.

NOTE: the banana plugs can be stacked on each other, allowing one output to supply multiple inputs.

DO NOT send more than one output to one input!

If you want to read more into the Buchla check out this link:
https://people.finearts.uvic.ca/~aschloss/course_mat/MU307/MU307%20Labs/Lab3_BUCHLA/Buchla_manual%20ASCII.pdf

MIDI/USB Decoder Model 225e (MIDI to Voltage Converter)

So as shown before, the Buchla contains several different modules for sound design. Each individual module has its different functions. We'll be specifically talking about the MIDI/USB Decoder Model module as it will be your portal from MIDI to the Buchla. This module is located in the bottom center of the Buchla console right above the oscillator controls.

Below you can see an example image of the module itself:

# Highly Recommend you read the module guide below before continuing:

https://people.finearts.uvic.ca/~aschloss/course_mat/MU307/MU307%20Labs/Lab3_BUCHLA/MIDI-USB%20DECODER_225e_April7_2016_UserGuide.pdf

Overview of MAX/MSP

MAX/MSP is a visual programming language for music and multimedia. The program gives you the creative liberty to make your own patches for experimentation. There are plenty of different tools to help you create awesome patches.

Regardless of what patch you create, your end goal should be to put out MIDI data. This is the data that will be pushed out to the Buchla in order to control it from MAX. Within Max there exists a few nodes that will convert your data into MIDI data.

The **noteout** node transmits MIDI messages to a MIDI device. It has three inlets. The first on the left is for pitch, the second for velocity and the third for which channel the note-on messages will be transported through.
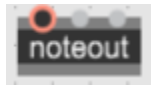
Here is a link to the node documentation:
https://docs.cycling74.com/max8/refpages/noteout

There are few other nodes you might want to try out and experiment with including *xnoteout*, *midiout*, *xbendout* and more. Remember that MAX is a playground where you can try all sorts of ideas. Get creative and try out different things. The patches provided in this guide are simply to get you started. Feel free to use them as a start off point and add to them to make more complex patches.

Here are few links if you need to get more familiar with MAX/MSP and some node references:
https://cycling74.com/products/max
https://docs.cycling74.com/max8
https://docs.cycling74.com/max8/vignettes/MIDI_topic

Getting Started (How to connect everything)

Step 1: Turning Everything On

This simply is turning all the equipment on. This includes all the equipment in the control room like the speakers, the console, the computer, the Buchla, and even the lights so you aren't working in the dark!

When turning on the console, make sure the volume isn't on mute. Often you might find yourself wondering why sound isn't coming out and it is usually from little mistakes like leaving the sound on mute. The more you take the right steps in the setup, the more likely your session will go smoothly.

Next, switch on the Buchla with the switch located in the back part of the Buchla machine. You might have to move it a little sideways to reach it. When you turn it on, you should see some lights come to life on the Buchla.
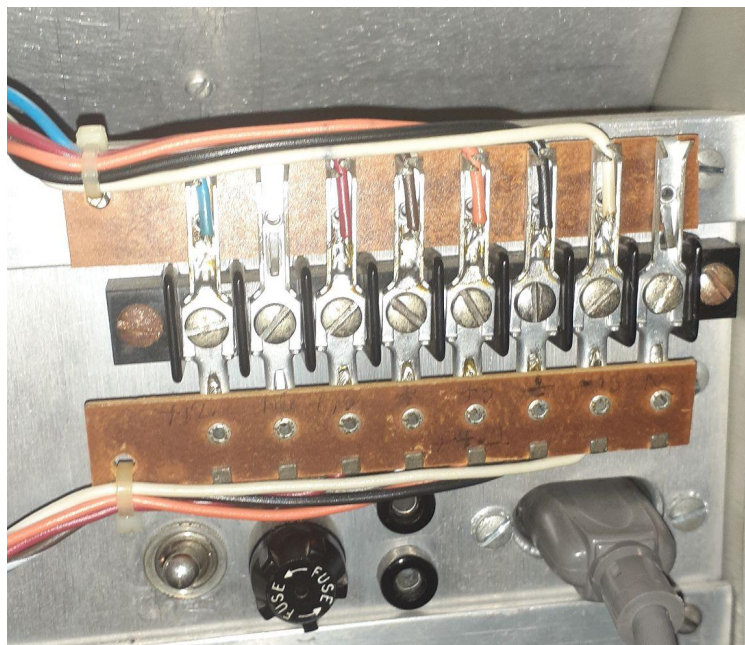
# Step 2: Setting Up the Environment

Part 1: The Buchla

In this step we will be setting up the environment for success so you can get started. Before doing anything else, go over the equipment list from the beginning of the guide to make sure you have all you need.

Next you will have to turn on the Buchla and connect it to **Rednet1**. The connection should be on the right of the Buchla and **Rednet1** might already be connected. If it is not, then it is connected behind the computer setup. Disconnect it and connect it to the Buchla. (Once you are done with your session, remember to reconnect it back where you found it).


Afterwards, turn on the computer and once you have it up and running check to see if Dante Virtual Soundcard is on. Then set up the Dante Controller so you can get sound from the Buchla to the speakers.
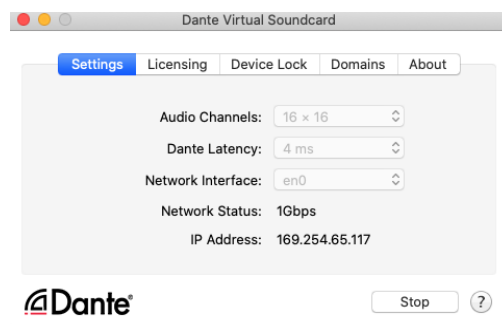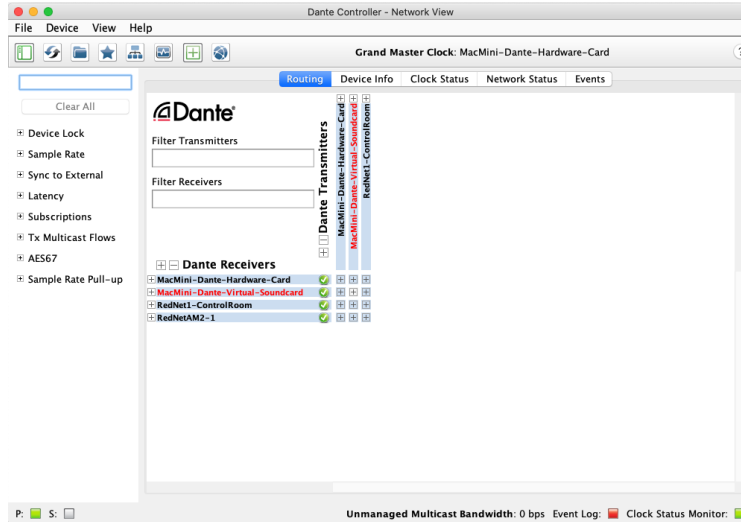
Now you can create a patch on the Buchla to see if you can get sound going. You can follow the simple patch provided below or any patch you would like. We just want to test for sound so you don't have to try to make any complicated patches if you don't want to. The strategy here is to keep it simple.
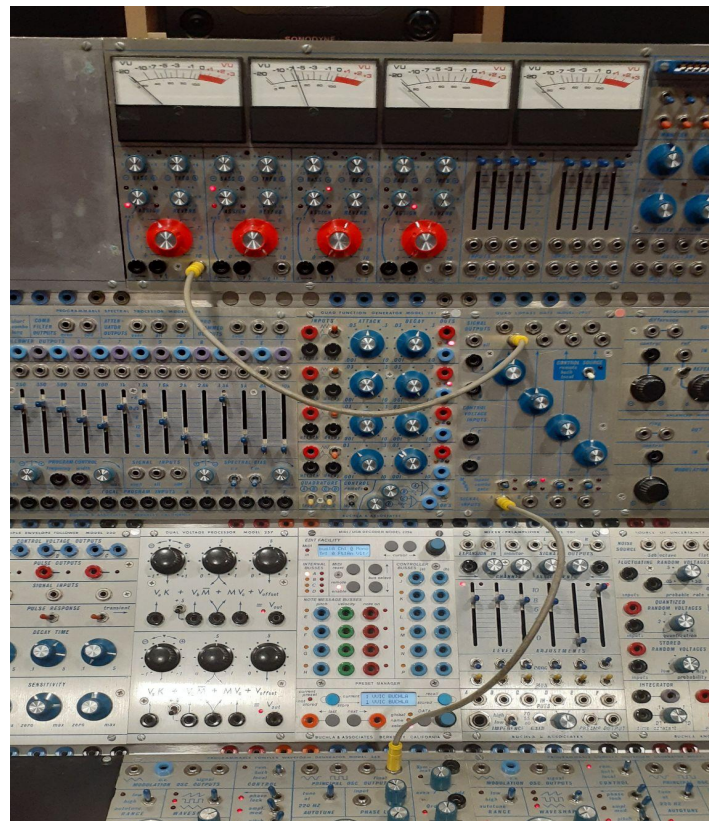

Sometimes you have to adjust a bit or do some troubleshooting. If you are having issues, look at the bottom of the guide under "Issues with the Buchla". Once you get sound working you can continue to the next step of setup.

Part 2: Arturia KeyStep

Connect the Arturia to the computer. The Arturia has a USB cable that plugs into the computer USB port. Then connect the MIDI cable to the MIDI out port of the Arturia.

Connect the other end of the MDI cable to the back of the Buchla. There is a MIDI IN connection right above all the other switches and cables. The Arturia will act as middle-man between the Buchla and the computer. It will relay the MIDI data from MAX to the Buchla.
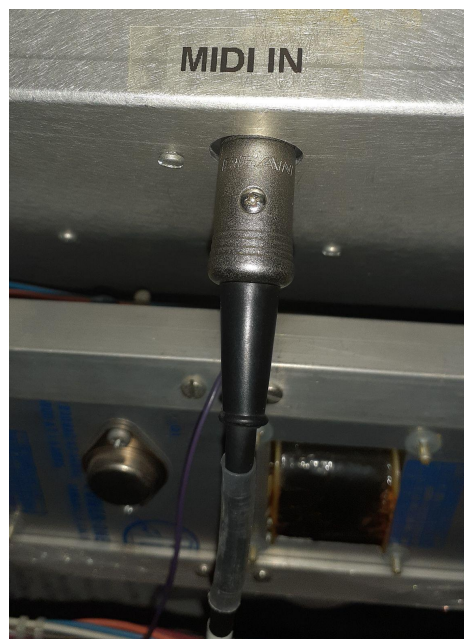
You can test to see if the Buchla is receiving any information from the Arturia. Check on the MIDI/USB Decoder model 225e module and make sure that a red light has appeared on the MIDI in light. Play any key on the Arturia and see if the red light next to the E Bus lights up. If working properly, the light should mirror your pressing of the key. (The light to the right of **note on**).
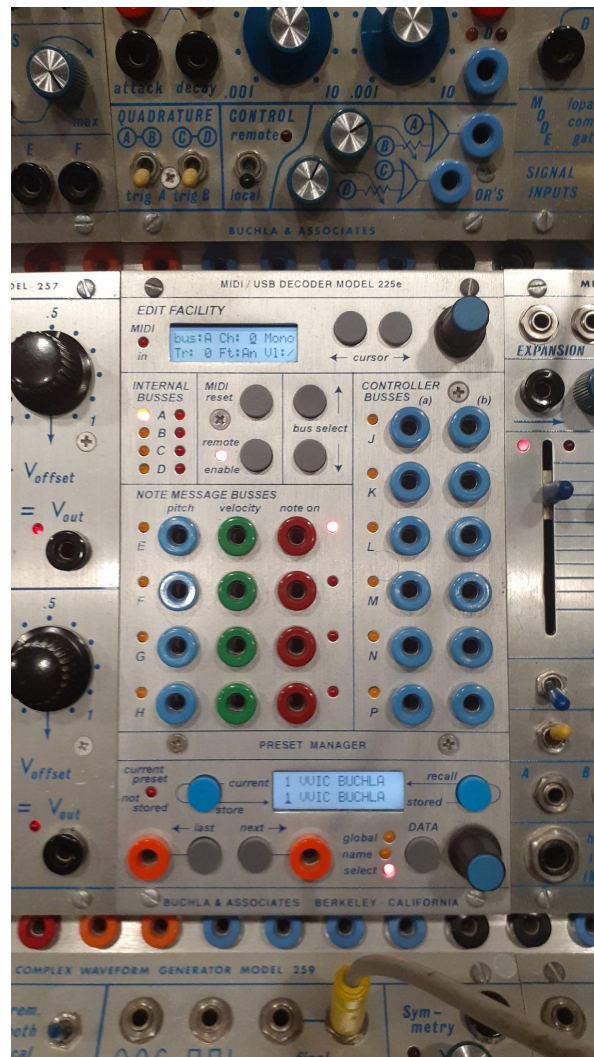
Note:
You might notice that if you play more than one key at the same time. multiple bus lights light up. The first key you play corresponds to the E bus, the second key to the F bus and so on. This might be interesting to note for future projects.

Now, you can add to your Buchla patch so that the MIDI signals control the Buchla. Follow the patch provided and see if the sound changes when you press the keys of the Arturia.
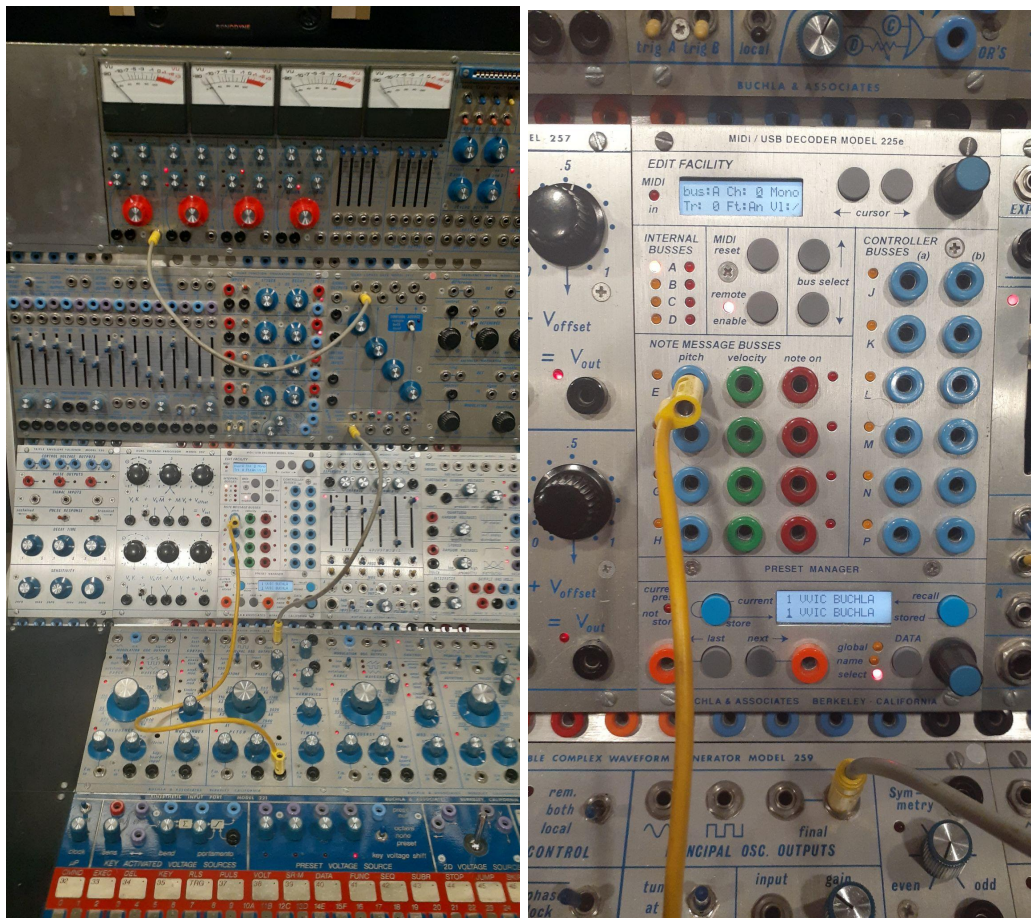
It seems you have successfully gotten the MIDI device to pass MIDI data to the Buchla. You can control the Buchla using your device now. If you add one small addition to the Buchla, you should be able to not just control the pitch but the amount of time the Buchla plays a note from the Arturia.

The **note on** is a pulse then can be imputed to the CV (Control Voltage) of the oscillator. You might notice that once you stop playing a key, the sound goes back to what originally the signal played at. This is because the Buchla continuously outputs a signal. The **note on** will only control how long that particular pitch from the MIDI input is played.

Step 3: MAX

Okay, now let's try getting the whole thing running with MAX. So you should already have the Arturia connected to the computer. Open up Max and the first test patch listed below. (Or you can open up your own MAX patch. Just remember to have the **noteout** node in your patch) I recommend you try it with the test patch first though. This way, if there is an issue, you can diagnose whether it is a problem with your patch or the equipment. The instructions will continue as if you chose to follow the test patch.
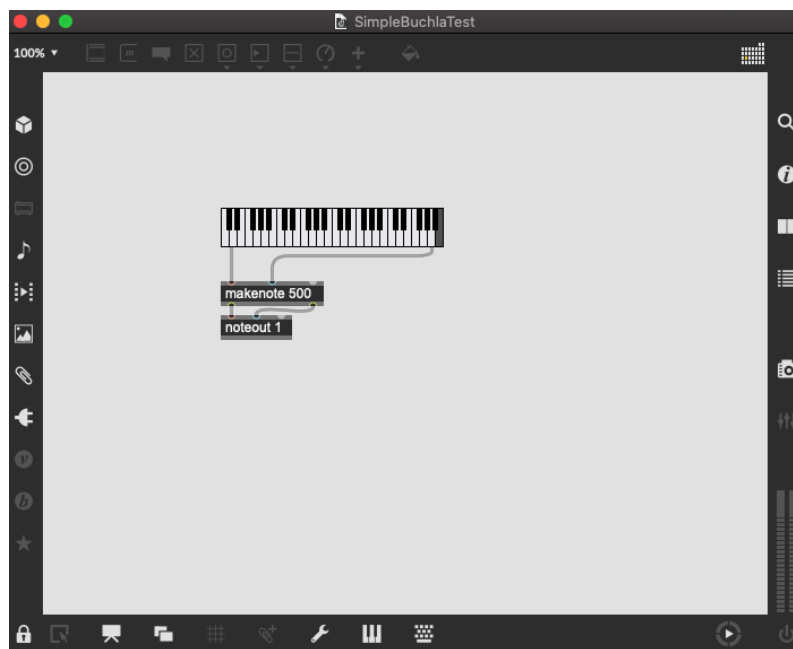
Here are 2 test patches you can try:
- SimpleBuchlaTest (Patch from Juan Flores)
- BuchlaTest (Provided by Dr. Andrew Schloss

You can download them from this link:

https://drive.google.com/drive/folders/1VOevKGM4HY38IJj1ykxDUIPBBizVUzB2?usp=sharing
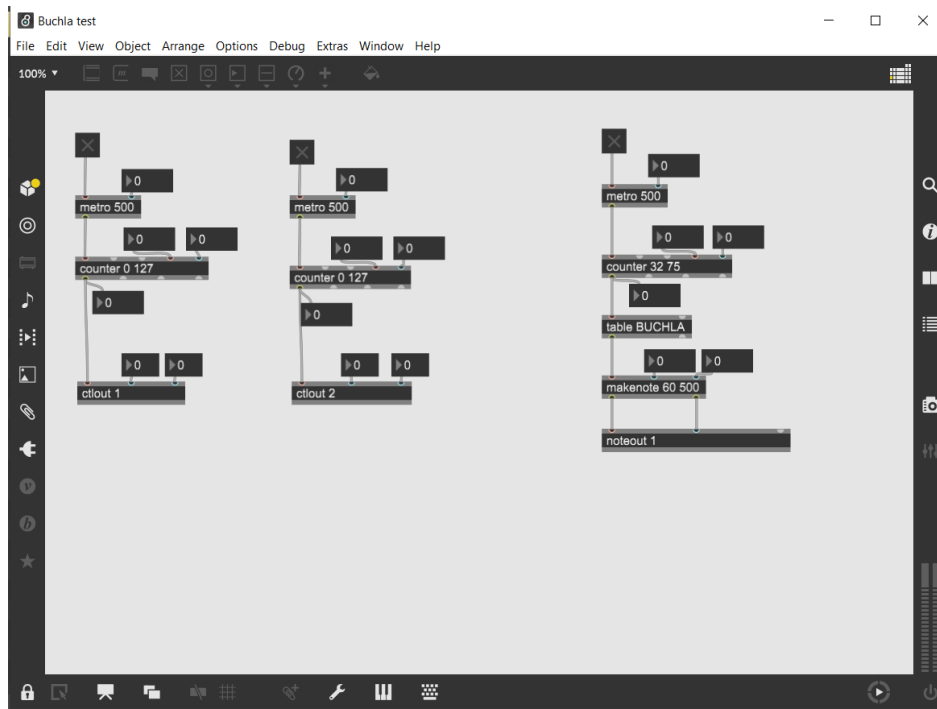
SimpleBuchlaTest:

Once you have opened up MAX and the test patch, you will have to switch the node to set the signal to go out to the Arturia. Simply double click on the noteout 1 node and look for the Arturia KeyStep.
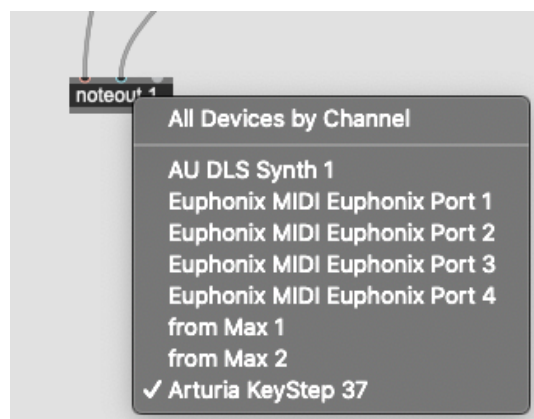
Now you can simply click on any of the notes on the keyboard of the patch. The sound of the Buchla should change depending on which key you click on.

Though you don't have to, I highly recommend you try the second MAX patch as well. Click on each node and read through the inputs and outputs of each node. You can also right click on them and read the information from Help that MAX provides.

Buchla test

Once you have opened up MAX and the test patch, you will have to switch the node to set the signal to go out to the Arturia. Double click on the noteout 1 node and look for the Arturia KeyStep.
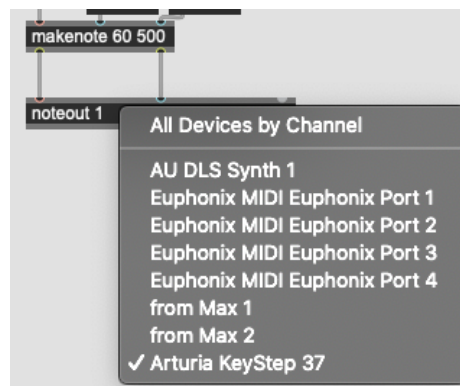
Now for the moment of truth. Get the Buchla to a sound you like. Mess with some of the values in the MAX patch. Once you are ready, double click on the table node and create a sequence for the patch.
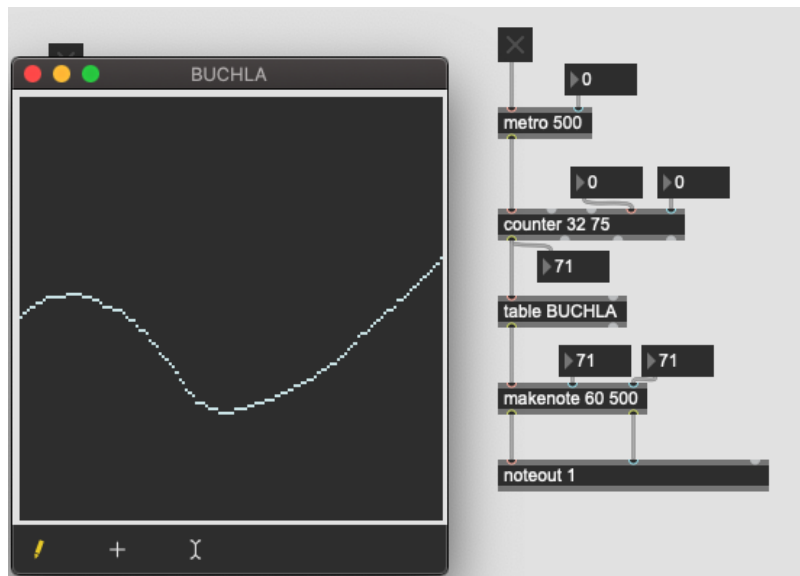
Now, simply turn on the patch by clicking the X.
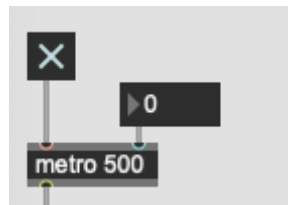
Viola, you should be hearing the result through the speakers!

Some Potholes (And How to Troubleshoot)

Issues with the Buchla

Note:
Something to consider when using the Buchla is that this is an awfully old device. It's quite a sturdy machine but still be cautious when handling it.

- If you aren't getting any sound, check the dials to see if they are set to the lowest value. Above each channel there is a dial which indicates the voltage. If the dial moves, it means you are getting a signal.
- Double check to see that the Buchla is connected to Rednet1!
- Some of the patch and signal chords are a bit old. Try to use chords that fit nicely into the port holes and don't feel loose.
- Look to see if all the knobs that control volume output aren't set to 0.
- Make sure you are getting sound from the Buchla before trying to set up the Arturia Keystep and the Max Patch. If there are any issues, it is best that you can start from what is working and then zero in on what the problem is.

Issues with MIDI Device

- Double check that the patch is sending the MIDI data to the correct device
- Notice that if the Max patch is on and sending MIDI data through the Arturia, the keys on the Arturia will not do anything. If you want to test the keys, you have to make sure the Max is running any patches.
- If you are using your own MIDI device and it isn't working. Try first with the Arturia KeyStep 37. It is possible the computer isn't reading your device or perhaps the MAX patch isn't sending MIDI data to your device.
- If you can't find the Arturia in the control room, it is possible that it has been moved to the recording room. You should have access to both rooms so you can step in and grab it.
  - Make sure that if it is plugged in a certain setup, that you record how it was plugged in and you return it to how it was once you are done.

Issues with MAX/MSP

- Check that your patch is sending the MIDI data to the correct MIDI device.
- If the patch isn't responding to your commands (For example, if you click on a key in the first patch but nothing happens) make sure you are not in edit mode.
- Check that your outputs are going into the correct inputs.