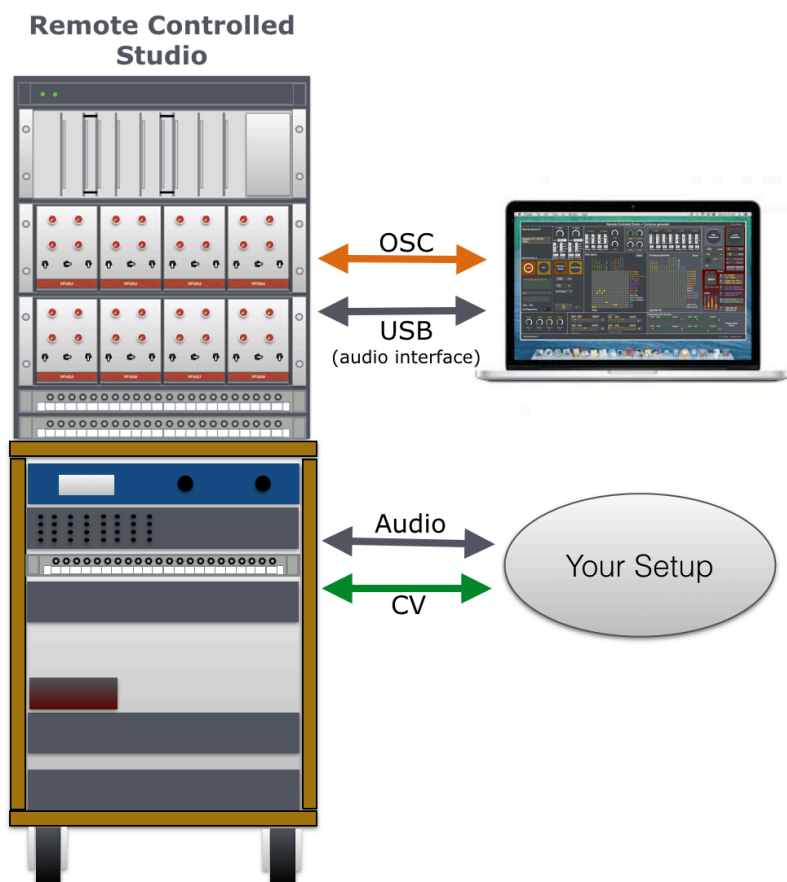


R.C. Studio UserManual

Remote controlled Studio



Written by: L van den Broek
Date: woensdag 23-10-17

Royal Conservatoire Den Haag
Juliana van Stolberglaan 1
2595 CA Den Haag NL

Revision 33

RC studio manual

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Quick start Reference

Since we all want to get started with a new device without reading a manual, try this instructions to get the RC-studio up and running. If you want to know more about the architecture and possible communication syntax, please read this manual. It's always useful!

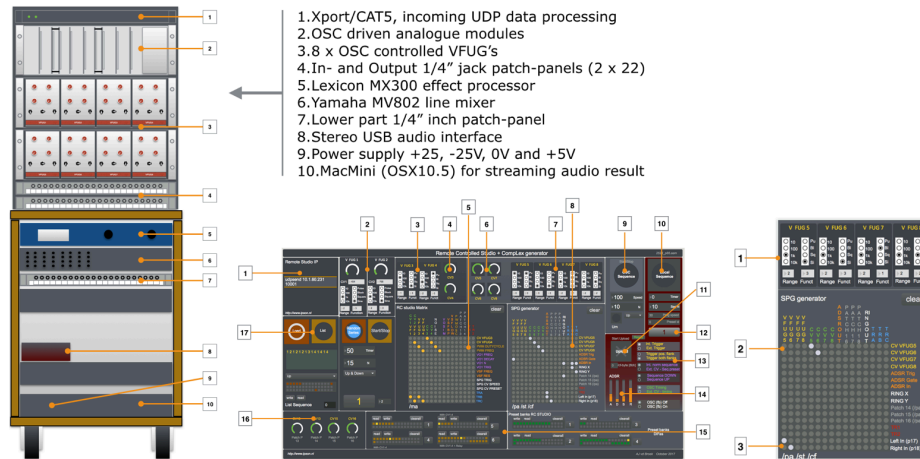


Figure 1. On the left the whole setup, in the middle the Max/Msp patch and on the right the first test example.

How to start, step by step

1. Switch on the RC-studio by connecting the mains (230V~). The connection can be found on the backside. The RC-studio will switch on, you hear a 'chime' (from the starting MacMini) and the network switch needs some time to properly boot (around 1 minute)
2. Connect the CAT5 cable to your computer and make sure your computer has a static ip-address in the 10.1.60.xxx range (no automatic ip-assignment).
3. Download the RC-studio Max-patch at: <http://www.ipson.nl/rc-studio-downloads>. The patch is created with Max/Msp version 7.1.0
4. Start the Max/Msp patch and make sure the right ip-address and port number are set in the patch. See [1] in the figure. For more info check manual page 8.
5. Connect the output of the Yamaha mixer patch-panel [7] connection 23 and 24 (out L and out R) to the input of a mixer and make sure the speakers are connected as well.
6. First start with a simple test to check if the connections work. Check the right-side matrix example in figure 1.

On the matrix (CompLex), select CV5 and CV6 to be the control voltage for VFUG5 and VFUG6 (see [2]). Select the frequency-range of 1k (audible) and select a wave-shape on both VFUG5 and VFUG6 (see [1]) - you will hear the clicking of the relays. Select the output of VFUG5 and VFUG6 to be connected to left/right (see [3]). You should hear a mix of two sine waves. The frequency of the sine waves can be changed by changing the value of CV5 and CV6.

If you hear a combination of two wave shapes and you can change the pitch by changing the control-voltages, the RC-studio is ready to be used. Enjoy!

IF the RC studio doesn't work ... read the manual :)

If the RC-studio is not responding to your OSC-messages, check your network- and audio-settings again - switch off your wireless network for example. Maybe you forgot something? The RC studio is a complex device, so it's easy to loose control. Be sure to also check the content of the manual. There's a lot of useful information that might solve your problem. If you (after reading this manual) still can not make it to work, please contact me - I will assist you if I'm available.

Contact information: e-mail: lex@koncon.nl - Phone internal KC: 070 - 31 51 591- Mobile/
WhatsApp: 06 50 66 12 82 - ewp.koncon.nl

1 Introduction

The **Remote Controlled Studio** is a small modular synth setup of which all functions can be controlled with OpenSoundcontrol messages (OSC). The OSC-messages are converted into analog control voltages, switching relays and changing hardware connections with a voltage controlled patch-panel. The onboard (old) Minimac and network-switch make it possible to stream the audio result (like internet radio) throughout the network. An additional USB stereo audio-interface enables the possibility to record and playback audio results. And with the 1/4" jack patch-panels multiple connections can be made with external devices.

The original setup of the RC-studio was a to create a environment for testing the OSC-devices that are developed in the Electronics Workshop. Converting OSC to control voltage or relay switching, this could all be tested in the RC studio. Years ago the eight old VFUG's (Voltage controlled Function Generators) that used to be part of the analogue studio of Sonology (Bea-5), were replaced by twelve new VFUG's. Re-using the 8 old VFUG's was the first step towards the RC studio as it is now.

Since the RC-studio was also a (small) part of my master research and I did a presentation during a colloquium in the beginning of 2017, the project started to draw attention. I want this device to be available for students to work with and for that reason I write this manual. How does it work and how can you control it? It's important to say that this project will always be work in progress. In order to get feedback and keep on improving this RC-studio I will place it in a studio (Bea-6) that is available for every student.

An overview of all the main components in the RC studio:

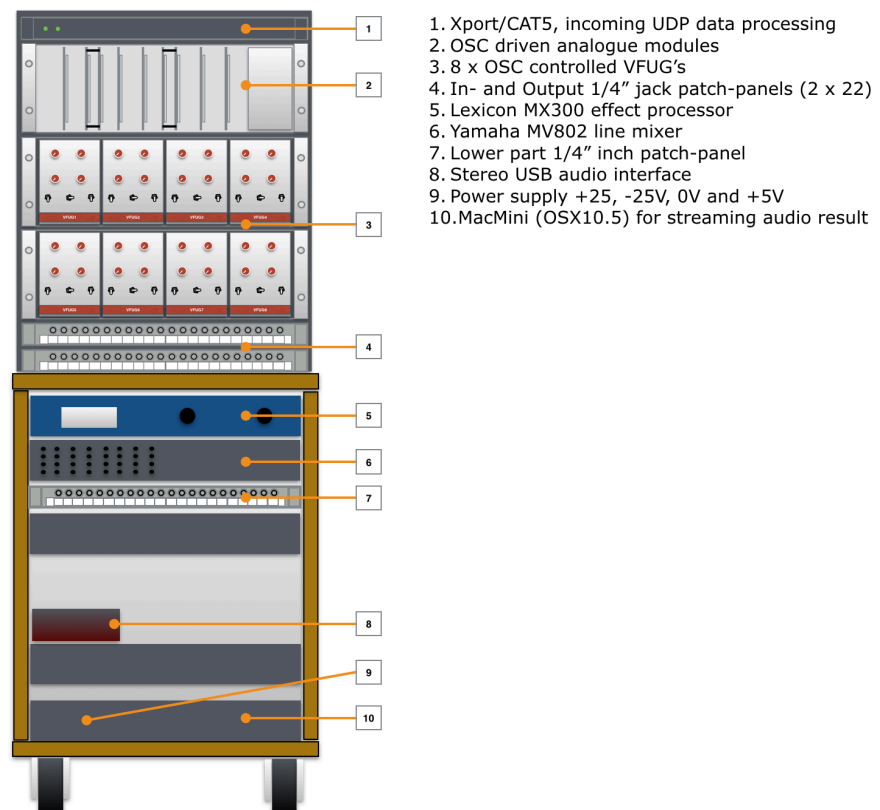


Figure 2. The RC-studio from top to bottom

1.1 What's new?

In this 'What's new?' part of the manual the latest changes will be described - the latest changes will be on top. Also check the website for the actual state.

<http://www.ipson.nl/projects/rc-studio-project>

Updates:

1-11-2017 (version 1.3)

The first release of the RC-studio to studio Bea-6.

1.2 Known issues

When you develop a new instrument, design new software or write new firmware, there are always bugs to be fixed and decisions to be made. This is a list of the known bugs and issues.

20-10-2017 (and way beyond)

1. When an input signal is split to be routed to multiple outputs, the amplitude of the source signal will decrease. In other words, the more splits you make, the weaker the source signal will be. There's no easy solution to this 'problem' or feature. It could be fixed if the matrix would switch 2xAD75019 chips at once. My plan is to fix and redesign this issue.

2. The CV inputs of the VFUG's are hard split to be connected to the matrix output AND to the 1/4" jack panel. It seems that these connections bite each other. I still have to see what's going on.

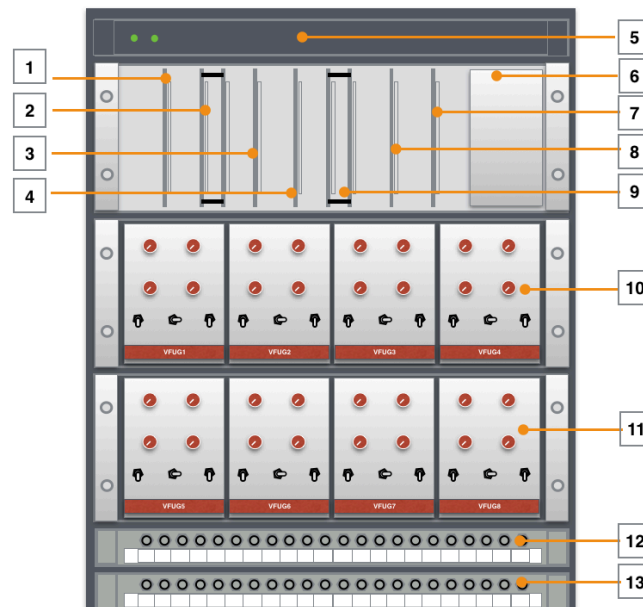
3. The VC-PWM is a PWM signal created with a Microchip microcontroller, receiving OSC. It seems that the CV input scaling is quite sensitive or hard to drive. I will definitely modify this.

4. The Macmini I use to stream the audio (NiceCast application) to the net has OSX 10.5 - not really compatible anymore with common interfaces.

5. The 'inside' of the Max/Msp patch is not that organized. Sorry for the mess! :)

6. The VFUG's are old. This means they are not always that stable.

2 The studio setup



3. The upper part of the RC-studio.

The 19" module with the plastic glass-plate in front holds all the important modules that make the RC studio what it is. The modules are build by hand on 'Eurocard' printed circuit boards (PCB's) that comply with the Sonology Bea-5 standard. The eight old VFUG's can be found in the middle.

1. This board is a combination of a noise generator and a Voltage Controlled Pulse Width Modulator.
2. The CompLex. This board is the result of my master-research project and holds the voltage controlled matrix that can be used as matrix but also as audio-generator.
3. A voltage controlled state variable filter (VSF)
4. The 12 bit DA board. This board holds 16 times 12-bit Digital to Analogue convertors. It receives OSC data and it will convert this data into DC control-voltage from 0V-5V.
5. The one unit high 19" module on top holds the XPort- This network-port (embedded webserver) receives the OSC-information from the connected host (your computer) or the users of the internet and converts it into RS-232 data that is send to the different modules. The small green LED's indicate power-ON and message receive.
6. The whole studio does have a lot of different power supplies. This is one of them, providing the RC-studio with -15, GND and +15V.
7. A Vosim (Voice Simulation board). This board generates bursts of half sine waves, triggered by an external trigger.
8. ADSR-module. This module is a combination of a ADSR generator and a VCA combined.
9. The first version of the matrix. This is the heart of the RC-studio. The inter-connections between the different modules will be realized through this module.
- 10 and 11. The old VFUG's (Voltage controlled Function Generators)
12. The output patch-panel with 1/4" jack
13. The input patch-panel with 1/4" jack

2.1 The architecture

The setup of the RC-studio changed many times the last years and it will keep on changing when more users share their ideas. In the figure below a complete overview is shown of all the internal and external connections. The colors that are used, refer to the colors used within the Max/Msp patch.

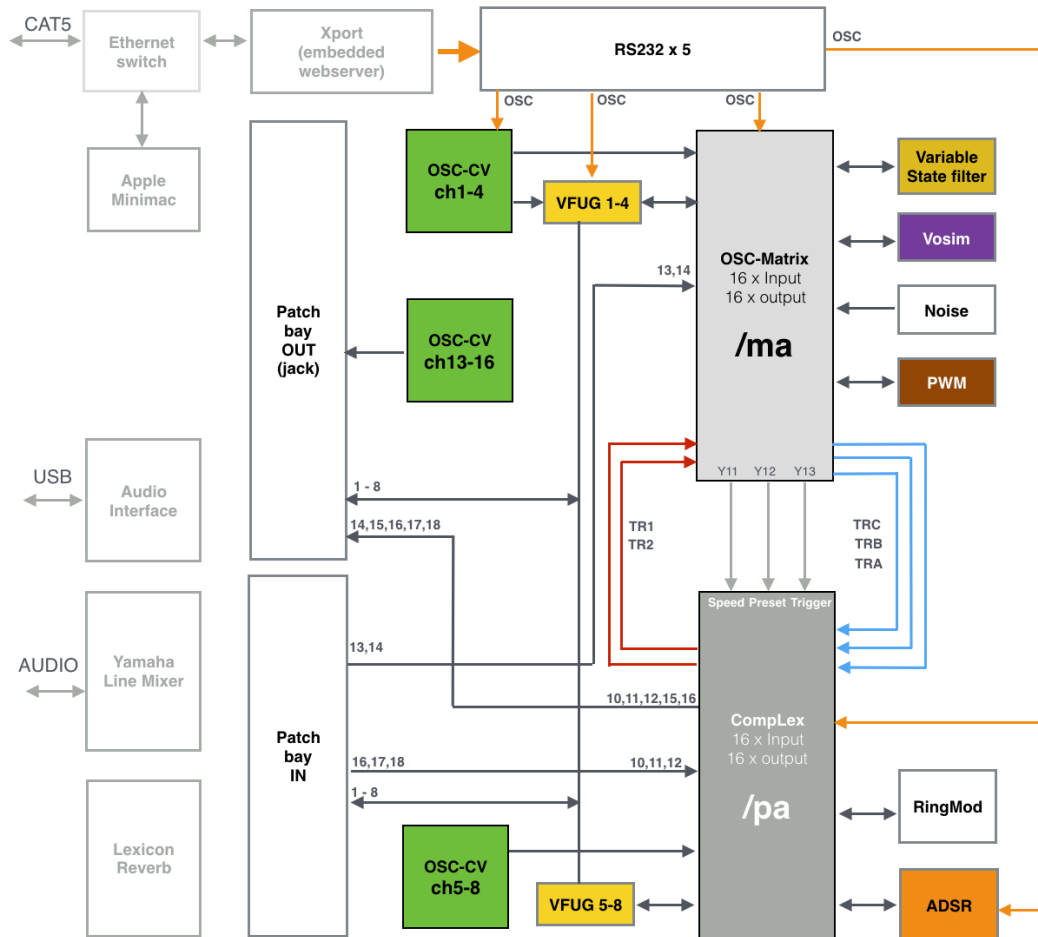


Figure 4. Internal connections of the RC studio

The heart of the RC-studio consists of two matrices (see figure 4). The first matrix (OSC-matrix, /ma, light grey) is the older matrix module (the first version I made). It is capable of switching 256 switches On/Off at once to create connections or patches. The second one (CompLex, /pa, darker grey) is the matrix with the nickname 'CompLex' and is a result to my master research project. The CompLex is a voltage controlled and voltage triggered audio matrix, capable of switching at high speeds. The '/ma' and '/pa' indication refer to the OSC-string address-tag that has to be used to drive the matrices. Read more about this in the chapter 'communication', on page 13.

The '/ma matrix' has 16 audio/cv inputs and 16 audio/cv outputs. It has multiple modules connected to it (see figure) like the Vosim, a VSF, Noise, 4xVFUG and a VC-PWM generator. It has 3 dedicated output connections that are directly linked to 3 inputs of the second matrix, the CompLex - these are TRA, TRB and TRC (transfer). The CompLex has 2 direct output connections as well, connected to the input of the OSC-matrix called TR1 and TR2. Detailed overview of the connections can be found on page 10.

The OSC-matrix also has 3 outputs that are directly linked to the 3 voltage control

inputs: CV-speed, CV-preset and trigger input. The CompLex, also called the Voltage Controlled Signal Path Generator (VC-SPG) is capable of switching between patch presets at high speeds (audio rates). The OSC-matrix can therefor drive the CompLex matrix. Both the matrices have direct connections with the patch panels (12 and 13 of figure 3), making it possible connect to the outside.

2.2 The patch-panels

The RC studio has three different 1/4" jack patch-panels. Two panels are part of the upper part of the RC-studio and one of the patch panels is located in the lower section.

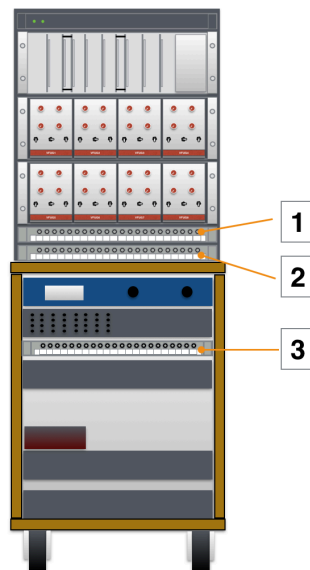


Figure 5. The RC studio with the 3 different patch panels

Nr 1. is the **Output** patch panel:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
VFUG1	VFUG2	VFUG3	VFUG4	VFUG5	VFUG6	VFUG7	VFUG8	VosIM1	Vsf L	Vsf BP		CV13	CV14	CV15	CV16		/pa P14	/pa P15	/pa P16	Left Out	Right Out
OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT		OUT	OUT	OUT	OUT		OUT	OUT	OUT	OUT	OUT

Output connections for the VFUG1-8, Vosim, Variable State Filter, Control voltage and direct connections to the 2 matrices.

Nr 2. is the **Input** patch panel:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
VFUG1	VFUG2	VFUG3	VFUG4	VFUG5	VFUG6	VFUG7	VFUG8		VSF IN			/ma X13	/ma X14		/pa X10	/pa X11	/pa X12	Mix ch1	Mix ch2	Mix ch3	Mix ch4
CV IN	CV IN	CV IN	CV IN	CV IN	CV IN	CV IN	CV IN		IN			IN	IN	IN	IN	IN	IN	IN	IN	IN	IN

VFUG control voltage input 1-8, Variable state filter input, Matrix input, ann 4 fixed lines to mixer input ch1-4

Nr 3. is the patch-panel of the lower part of the RC-studio:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
				Mix ch5	Mix ch6	Mix ch7	Mix ch8		Behr OutL	Behr OutR		Lexi R	Lexi L	Lexi R	Lexi L					Aux1	Aux2	Left	Right
				IN	IN	IN	IN		OUT	OUT		IN	IN	OUT	OUT					OUT	OUT	OUT	OUT

Tis patch-panel has direct connections to the Yamaha mixer, the Lexicon MX300 en the USB audio interface.

2.3 Connecting the RC studio to your computer

The first step in using the RC-studio is to connect it to your computer with a the standard CAT5 network cable. To power up the whole studio, connect the main-plug to a 230V~ wall socket. The studio will switch on (some relays will click and are set). For the network switch to startup can take up to one minute. So be patient please.

If you directly connect your computer to the RC-studio (without the KC-network) you have to provide your own computer first with a static ip-address. Depending on the platform you are working with (Mac or PC), you have to go to network-settings and set the ip-number of your computer to (for example) **10.1.60.1** and change the mode (configure IPv4) to 'Manually' (see figure 6). If you keep your settings set to 'automatic', your computer will ask the RC-studio for an ip-address and this will not work - the RC-studio cannot act like a DHCP-server - and it will not provide your computer with a valid ip-address. The network mask can be set to 255.255.0.0

If you start the Max/Msp patch, your computer (for example ip address 10.1.60.1) will send all its data to the **RC studio, ip address 10.1.60.231: port 10001**

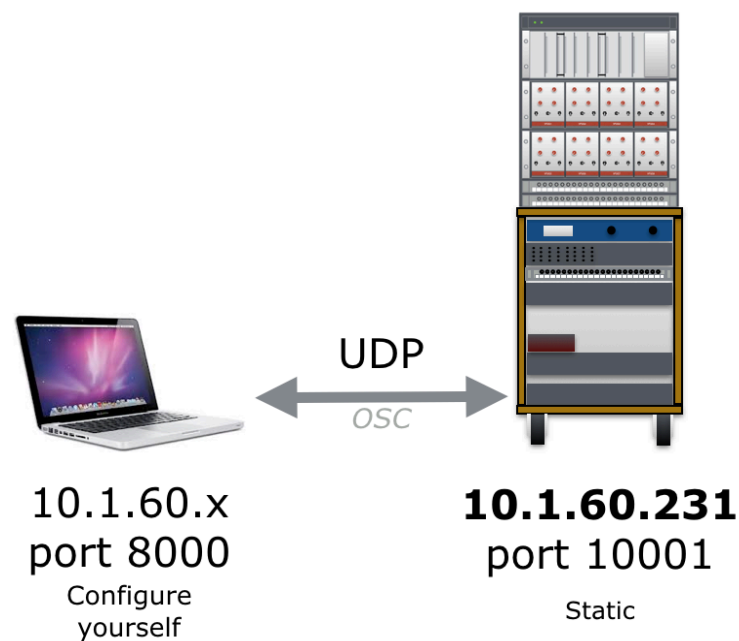


Figure 7. The RC studio connected to a laptop with the right IP-settings

3 The Max/Msp patch

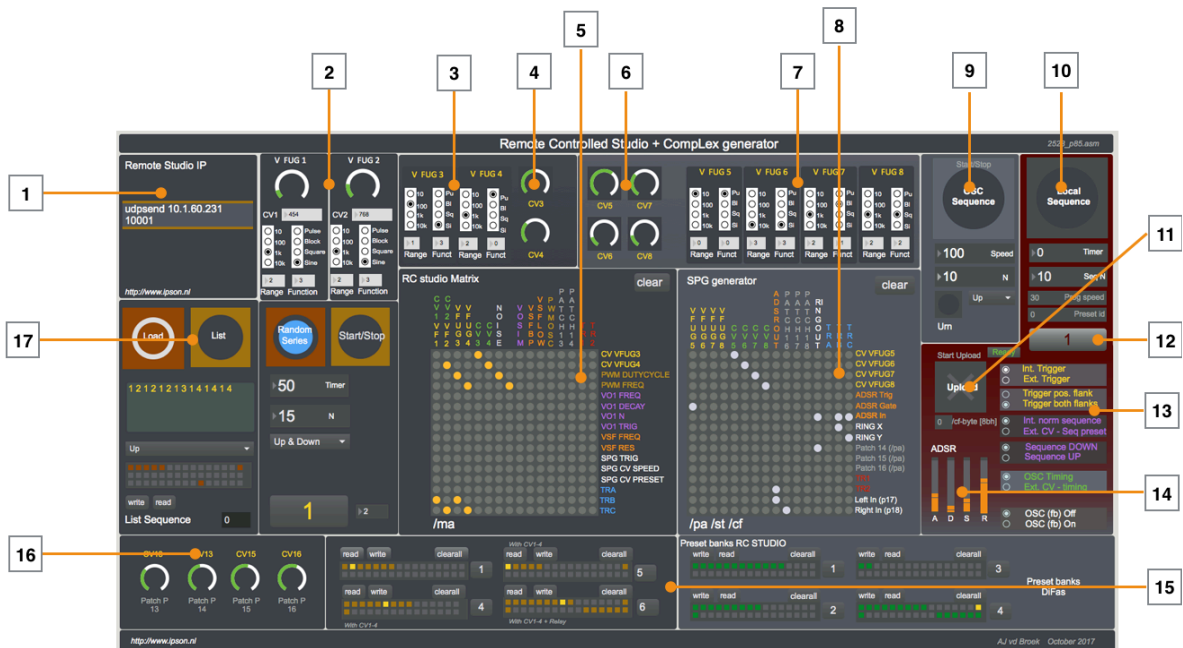


Figure 8. The Max/Msp patch that generates different streams of OSC data

The Max/Msp patch shown in figure 8 can completely drive the whole RC-studio. It generates all the correct OSC-messages for driving the modules and the two matrices. This patch is a personal (partially chaotic) interpretation, and please feel free to re-design the patch or rip it apart. The syntax of the OSC-messages will be explained in the chapter OSC-communication, on page ??.

1. This is the IP number of the RC-studio with the right port information. The Max/Msp patch sends (udpsend) all OSC data to this IP-address and port (10001).

2. VFUG 1 and VFUG 2 with the settings of wave shape, frequency range (10,100,1k, 10k) and the pitch. Both VFUG1 and 2 are directly connected to CV1 and CV2 (outputs 1 and 2 of the OSC-CV DA convertor) and can not be patched to external control voltages - in other words, the pitches are fixed to CV1 and CV2.

3. The pitch control voltage can be patched of VFUG3 and VFUG4.

4. Control voltages 3 and 4 are available on input 5 and 6 of the /ma matrix.

5. The matrix object driving OSC-matrix /ma. By clicking on one of the dots of this matrix (making a connection from the input to the output) a OSC-message will be sent from your computer (the Max/Msp patch) to the RC studio. In total there are 256 connections (16 x 16) that all can be set and cleared. Storing a patch can be realized (see 15) with the use of the preset-objects. A <shift> click will store the patch.

6. More Control voltages that are available on the /pa matrix, or CompLex.

7. VFUG 5,6,7 and 8. All four pitches of these generators can be patched through the matrix.

8. This is the same object as use in (5), but it generates a different OSC-message (/pa). Also these patches can be stored in the preset object underneath.

9. Since the CompLex is a generator, there are a few different ways to sequence through presets. When button (9) is pressed, the Max patch will sequence through the active preset-bank that is indicated at (12). This is a so called local sequence. You can change the amount of presets in the sequence (1-32) and the direction (up, down, pendulum). The time in msec (milli seconds) indicates the speed of the sequence.

10. The preset-banks (1-32) can also be uploaded into the local memory of the CompLex. In this way, the sequence through the different presets can be triggered by

external voltages. The configuration of the external triggers and control voltages can be set at (13).

11. Pressing this button will upload the active preset into the local memory of the CompLex generator or matrix.

12. This is the indication of the active preset bank.

13. As explained in (10), the configuration of the external voltages and triggers can be set in this area.

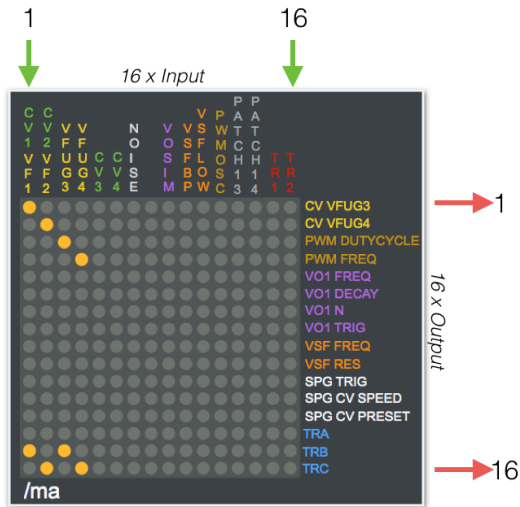
14. The ADSR module has 4 faders (variables) that can be changed: Attack, Decay, Sustain and Release. All four variables are being sent into one separate OSC-message.

15. For both the OSC-matrix (/ma) and the CompLex (/pa) the patches can be stored in these preset-banks.

16. Extra control-voltages that are available on the external patch panels (output).

17. Instead of sequencing in order (up/down/pendulum) through the patches in a preset-bank, you can also create a list of different preset numbers. When the button 'List' is active, the sequence will play according to this list.

3.1 The ins and outs of /ma matrix (OSC_matrix)

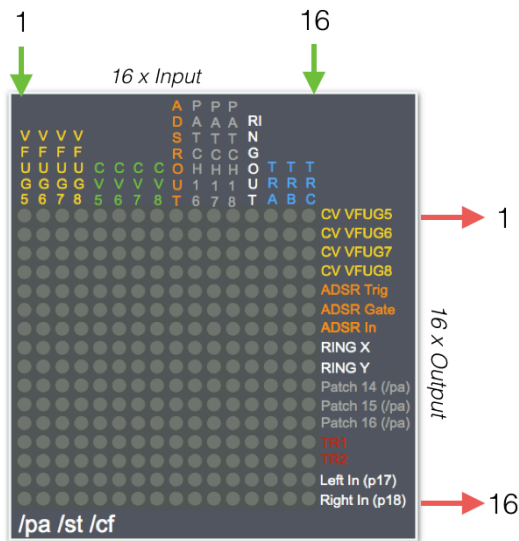


/ma matrix (OSC-matrix)

- Input 1:** The output signal of the VFUG1, with the fixed pitch cv from cv1
Input 2: The output signal of the VFUG2, with the fixed pitch cv from cv2
Input 3: The output signal of the VFUG3 - cv input for pitch can be patched
Input 4: The output signal of the VFUG4 - cv input for pitch can be patched
Input 5: Control voltage output number 3 (CV3)
Input 6: Control voltage output number 4 (CV4)
Input 7: Noise
Input 8: Not connected (yet)
Input 9: Vosim output
Input 10: Variable state filter low output
Input 11: Variable state filter band pass output
Input 12: Pulse Width Modulator (PWM) output
Input 13: Input patch panel connection number 13
Input 14: Input patch panel connection number 14
Input 15 : Transfer 1 (TR1) from CompLex
Input 16 : Transfer 2 (TR2) from CompLex

- **Output 1:** CV input VFUG 3
Output 2: CV input VFUG 4
Output 3: CV for PWM duty-cycle
Output 4: CV for PWM frequency
Output 5: CV for Vosim Frequency
Output 6: CV for Vosim Decay
Output 7: CV for Vosim (N)umber
Output 8: Vosim Trigger input
Output 9: CV for the frequency of the VSF
Output 10: CV for the resonance of the VSF
Output 11: Trigger input for the second matrix , the CompLex
Output 12: CV input for the Speed control of the CompLex
Output 13: CV input for the Preset control of the CompLex
Output 14: Transfer A - direct link to input 14 of the CompLex
Output 15: Transfer B - direct link to input 15 of the CompLex
Output 16: Transfer C - direct link to input 15 of the CompLex

3.2 The ins and outs of /pa matrix (CompLex)



/pa matrix (CompLex)

- Input 1:** The output signal of the VFUG 5
Input 2: The output signal of the VFUG 6
Input 3: The output signal of the VFUG 7
Input 4: The output signal of the VFUG 8
Input 5: CV5 output
Input 6: CV6 output
Input 7: CV7 output
Input 8: CV8 output
Input 9: ADSR audio output
Input 10: Input Patch panel number 16
Input 11: Input Patch panel number 17
Input 12: Input Patch panel number 18
Input 13: Ringmodulator output
Input 14: Transfer A (TRA) from /ma matrix
Input 15: Transfer B (TRB) from /ma matrix
Input 16: Transfer C (TRC) from /ma matrix

- **Output 1:** CV input VFUG 5
Output 2: CV input VFUG 6
Output 3: CV input VFUG 7
Output 4: CV input VFUG 8
Output 5: Trigger input for ADSR
Output 6: Gate input for ADSR
Output 7: ADSR audio input
Output 8: Ringmodulator input X
Output 9: Ringmodulator input Y
Output 10: Output patch panel number 14
Output 11: Output patch panel number 15
Output 12: Output patch panel number 16
Output 13: Transfer 1 (TR1) - direct link to /ma matrix
Output 14: Transfer 2 (TR2) - direct link to /ma matrix
Output 15: Output patch panel number 17 (fixed to input CH1 of Yamaha mixer)
Output 16: Output patch panel number 18 (fixed to input CH2 of Yamaha mixer)

4 OSC syntax

The RC-studio configuration depends on correct OpenSoundControl messages, that comply with the right syntax. Within all the modules that are able to receive OSC-messages, small powerful micro-controllers handle the incoming data. If the received OSC-message is not compliant, the messages will be ignored and there will be no result. The next few chapters explain in detail the syntax of the OSC-messages.

The RC studio is driven by OpenSoundControl or OSC. OSC is a protocol for communication among computers, sound synthesizers and other multimedia devices that are optimized for modern networking technology. Within the design of the RC studio only OSC-messages are used to communicate with the external computer. An OSC-message consists of three parts: an OSC address-tag, an OSC type-tag and the OSC argument(s). Figure 1.9 shows the generic OSC-message that is used for driving the studio.

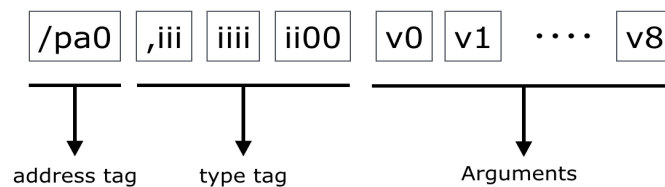


Figure 9 SPG OSC-message configuration

All OSC-communication is achieved with blocks of 4 bytes (1 byte = 8-bits) and the characters use the standard ASCII coding for the definition of the right symbol. In figure 9 you will notice the extra 'zero' after the address tag '/pa0'. This zero acts as a separator between the address-tag and the type-tag and it completes the complete data-string to a multiple of 4-bytes. After the definition of the type-tag consisting of nine 16-bit integers (9 x i), two zero's are added again to complete the multiple of 4 and to accomplish the separation between the type-tag and the OSC-arguments. Both the /pa and the /st strings contain a total of 9 integers [v0 - v8]. For the communication with the RC studio, the address-tag (/pa in figure9) can have different names:

/ma : this address-tag is used for driving and changing the switches in the OSC-matrix

/pa : abbreviated from the word 'patch' this is used to drive and change the switches in the CompLex matrix.

/cf : this short OSC-message, consisting only of one OSC-argument is used to configure and control the CompLex. You can define at which speed and which external voltage it should be triggered.

/v1 : the OSC to control-voltage board uses the v1 address tag to create 16 times 12 bit control voltages.

/rx : This address tag with different numbers (1-8) drive the switches of the VFUG's 1-8. It changes the wave shape and frequency range

/ev : The onboard ADSR modules can be driven by one short OSC-message starting with 'ev'.

4.1 Writing the matrix

To be able to write different matrix presets or patches to the matrix, it is necessary to write all 256 bits every time the presets changes in order to get stable behavior - that's the setup and the design philosophy of the Analog Devices AD75019 matrix chip inside the studio.

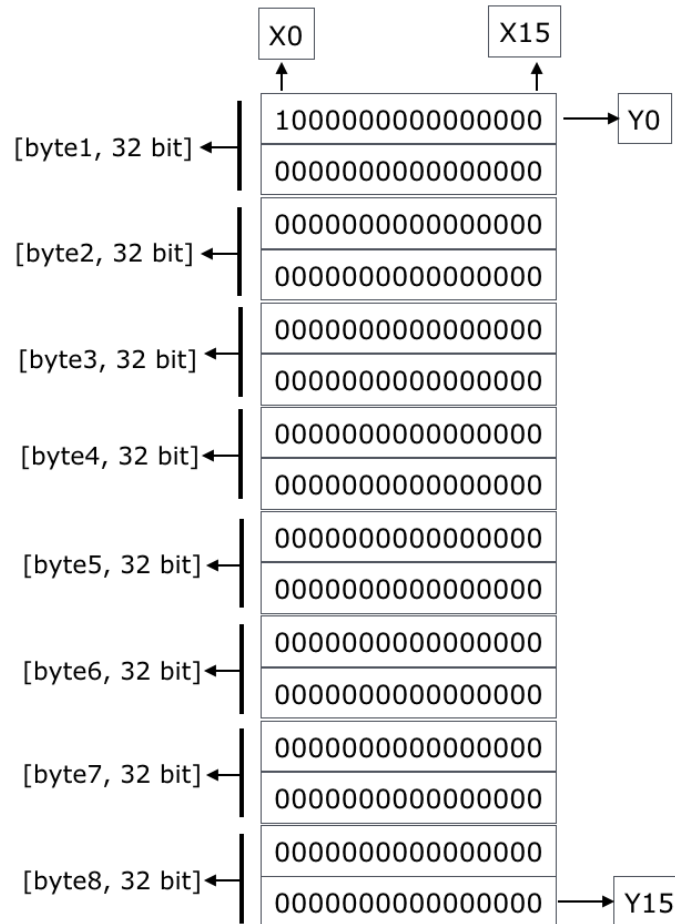


Figure 10. Bit representation of the matrix

Figure 10 shows the build-up of the OSC messages used to transfer presets, or patches, from your computer to the RC studio or vice versa. The first byte of the OSC-message, byte1, is a 32-bit integer and it holds the matrix setting from X0/Y0 to X15/Y1. The next byte (byte2) holds X0/Y2 to X15/Y3. And so on ... Notice the 'Yx' is increasing and that every byte always contains the settings from X0-X15.

4.1.1 The osc-message (/ma) to write the matrix

/ma [byte 0] [byte 1] ... [byte 8]

The OSC string starting with '/ma' is directly activated within the RC studio when it is received. It will instantly switch On/Off the corresponding switches in the matrix. The first 32bit-byte [byte0] is an extra byte which does not contain switch information, but it can hold information to configure the matrix. Byte 1 (32bits) to byte 8 (32 bits) represent the 256 switches in the matrix. Check figure 10. A few examples below.

Example 1

If you want to switch ON the X0 and Y0, you have to set the first bit of [byte1] to 1. This is switch X0/Y0. The last bit of [byte1] represents X15/Y1. See figure 11

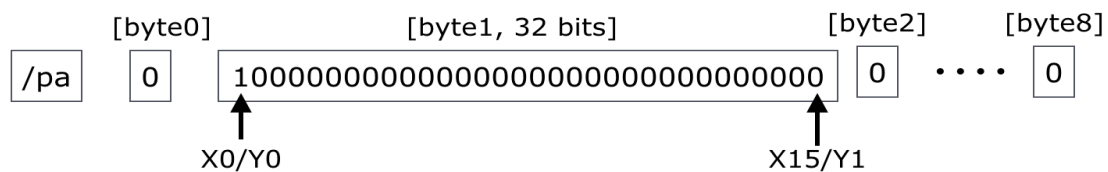


Figure 11 Switch ON X0/Y0

Example 2

Switching on only Y15/X15 (this is the last bit in the row of in total 256 bits):

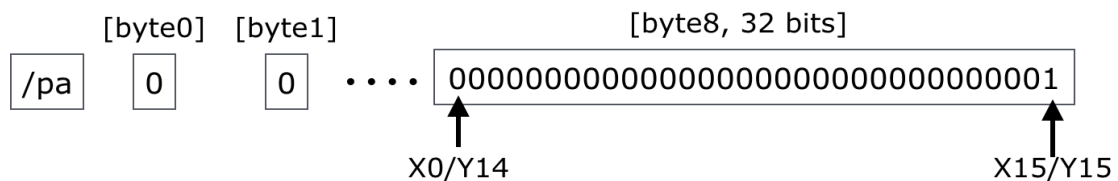


Figure 12 Switch ON X15/Y15

Example 3

If you want to switch OFF all the connections of the matrix, you have to send all zero's and all the matrix connections will be closed. Like this: /pa 0 0 0 0 0 0 0 0

4.1.2 The OSC-message (/pa) to write the Complex

/pa [byte 0] [byte 1] ... [byte 8]

The configuration of the OSC string starting with '/pa' is exactly the same as the previous /ma setup (see page 14). The only difference is the address tag.

4.1.3 Store OSC-message (/st)

/st [byte 0] [byte 1] ... [byte 8]

If the presets have to be stored in local-memory for later use without the computer connected, the OSC-message should start with '/st' (store). If the RC studio receives the OSC-message with this address-tag, the preset attached will be stored in local-memory. The first 32bit-byte [byte0] determines at which location the preset will be stored into depending on the preset-id. Byte0 also contains data that determines the amount (N) of

presets that will be part of the sequence. The remaining two bytes do not have a purpose (yet) and can be used for future development ideas.

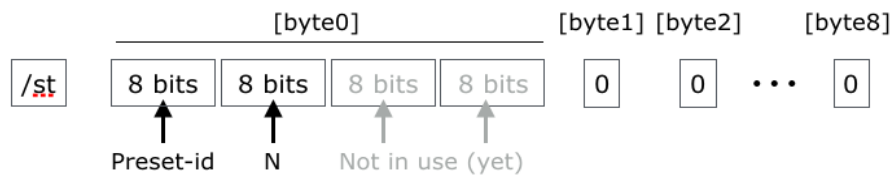


Figure 13 Storage OSC-message

Like the /pa message, [byte1] to [byte8] contain matrix switch information.

4.1.4 Configuration OSC-message (/cf)

The 'cf' (configuration) is a single byte string and contains data to change settings or configure the mode of the Complex module on the RC studio. The configuration osc-message is shown below:

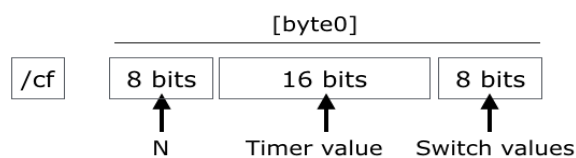


Figure 14 Configuration OSC-message

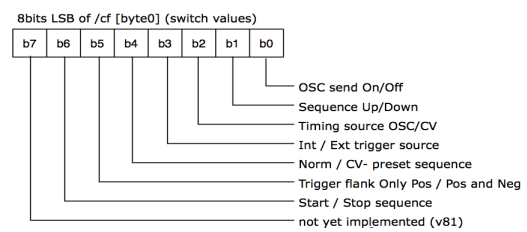


Figure 15 Switch values

Figure 14 shows the setup of the one data 32bit byte [byte0] which defines the configuration. The 8 bits on the right (the LSB bits or Least Significant Bits) contain the switch values with more detail shown in figure 15. The 16 bits in the middle contain the timer value. This value determines the sequence speed when the timing source is set to OSC. The 8 bits on the left (MSB or Most Significant Bits) contain the value N. This variable sets the amount of presets of a sequence.

If the Complex is in sequence-mode (it's running), changing the switch values will only take effect when you first stop and then start the sequence (in assembly version v85). The one switch which always will be checked during the sequence, is the Start/Stop switch.

4.2 The OSC-message (/v1) to write the 16 channel DA convertor

/v1 [byte 0] [byte 1] ... [byte 8]

The OSC-CV board which is embedded in the RC studio can be driven with the /v1 OSC string. The board has 16 separate CV outputs with a resolution of 12bit. If you send information to the board, you actually send all 16 values at once. The configuration of the /v1 string is shown below (figure 16).

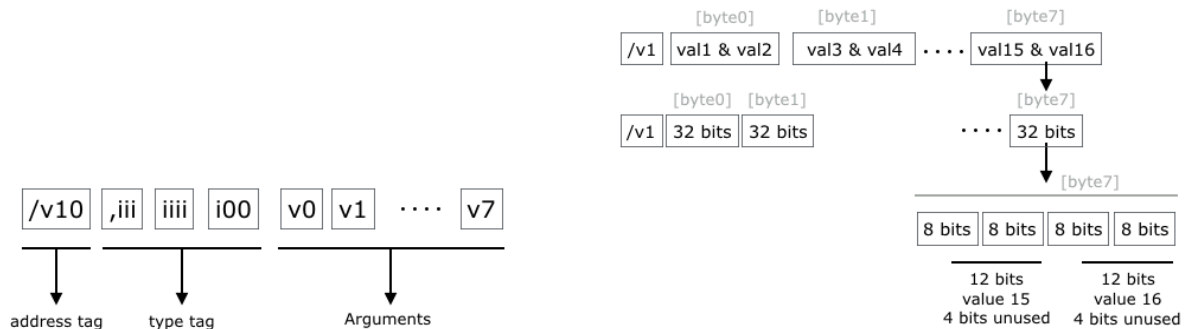


Figure 16. The configuration of the /v1 string (OSC-CV board)

Since this board is developed at the EWP as well, more detailed information about this board can be found on the ipson website:

<http://www.ipson.nl>

4.3 The OSC-message (/rx) to write the VFUG relays

/rx [byte 0]

To change the settings go the VFUG's like the frequency range and the wav shape, you have to send the /rx string. The variable x can be 1 - 8, defines which VFUG is receiving the OSC-string. The actual data of the two relays per VFUG is compressed into 4 bits (b0-b3), see figure 17.

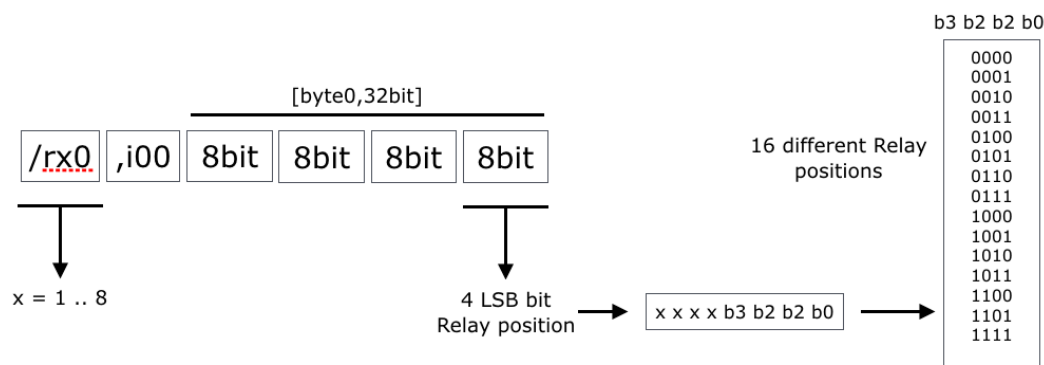


Figure 17. The /rx OSC string configuration

4.4 The OSC-message (/ev) to write the ADSR module

/ev [byte 0]

The envelope generator can be driven with one OSC-message, containing one 32 bit integer. The 32 bit integer is divided into 4 values, the Attack, Decay, Sustain and release. The ADSR module consists of a comet VCA (Voltage Controlled Amplifier) and a ADSR generator in one. The module has therefore an audio input, a trigger input and an audio output. The values of the ADSR are sent through OSC.

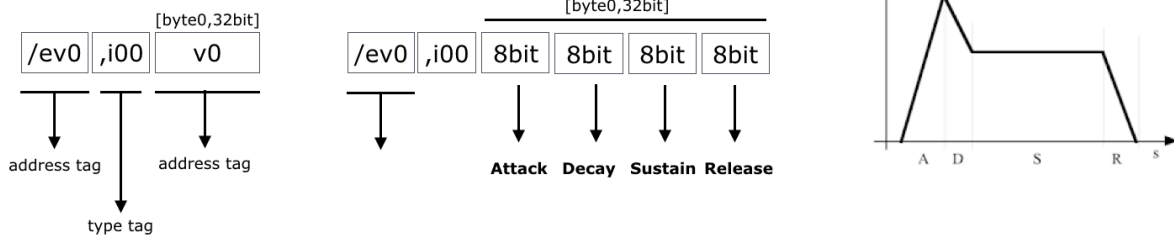


Figure 18. The ADSR byte configuration and an example of the curve.

5 Technical Specifications

Power-supply

The RC studio takes 230V~/50Hz and runs internally on DC +25V, -25V and GND. The modules need +12V, -12V and GND

Audio inputs and outputs

The audio signals vary from -5V to +5V. The control voltages change between 0V-5V. These inputs can take -5V to +5V on the CV input. (This is the audio standard from Doepfer (A-100 set)). The value will be re-scaled internally from 0 to 5V.

The 3 Neutrik patch-panels have 1/4 inch jack female connectors

Max/Msp patch

The Max/Msp patch can be downloaded from <http://www.ipson.nl>. The patch is created with Max/Msp version 7.1

Network

CAT5 / RJ-45 connection. 10/100Base ports.