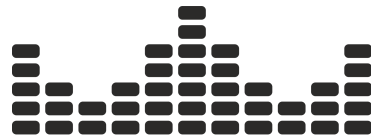


# VMU-1



# RSE

tube compressor/limiter (variable gain)

OWNER'S MANUAL



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## **From head of technology**

(INTRODUCTION)

*Dear valued customer,*

*Thank you for choosing our device. We're proud of crafting each piece of gear with care and dedication from our team in Ukraine. Our VMU-1 compressor is designed to expand your possibilities and remove limitations you may have faced before.*

*A vari-mu compressor is a type of analog compressor that uses vacuum tubes to control the gain reduction of the signal. It is also known as a tube compressor or a valve compressor. The term "vari-mu" refers to the variable-mu tube used in the circuit, which controls the amount of gain reduction applied to the signal. Vari-mu compressors are known for their warm and musical sound and are often used in recording studios for vocals, drums, and other instruments. They are also popular in mastering applications, where they can add subtle warmth and character to the final mix.*

*Although our compressor is based on the typical architecture of the variable mu compressor family, it has unique features that provide exceptional stability and deep compression. Our custom-built amorphous core transformers ensure that the signal remains crystal clear without any roll-off on the high and low ends.*

*We've included stepped regulators to make tuning easy, fast, and enjoyable. Additionally, we've used rare Soviet needle indicators as GR meters, which we've left unchanged to preserve their natural charm.*

*Please note that our compressor is power-hungry as it contains six tubes, producing up to 100 watts of heat. It's important to ensure proper ventilation by giving it some fresh air inside your rack. We've included plenty of vents on the back panel for this purpose.*

*Thank you again for choosing our product. We hope you enjoy using it as much as we enjoyed creating it.*

*Best regards,  
Roman Shevchenko*

## **MAINS CONNECTION**

The RSE VMU-1 compressor can be powered with either a 230V or 110V grid. It is important to note that the voltage is predefined by the manufacturer and cannot be adjusted operatively. To ensure safe and proper operation of the device, please follow these guidelines when connecting it to the mains:

1. Use only the power cord supplied with the VMU-1, or a replacement cord specified by the manufacturer.
2. Connect the power cord to a properly grounded AC outlet.
3. Do not use an extension cord or power strip with the VMU-1.
4. If you need to disconnect the power cord from the VMU-1, always pull it out by grasping the plug. Do not pull on the cord itself.
5. If you are unsure about any aspect of mains connection, or if you experience any issues with the VMU-1 after connecting it to the mains, please consult a qualified electrician or contact RSE customer support for assistance.

By following these guidelines, you can ensure safe and reliable operation of your RSE VMU-1 compressor.

## **FUSE REPLACEMENT**

In the event that the fuse in your RSE VMU-1 compressor needs to be replaced, it is important to use a 3A/250V slow fuse. To replace the fuse, follow these steps:

1. Unplug the power cord from the AC outlet and disconnect it from the VMU-1.
2. Locate the fuse holder on the rear panel of the VMU-1.
3. Use a small flathead screwdriver or similar tool to gently pry open the fuse holder.
4. Remove the old fuse and replace it with a new 3A/250V slow fuse.
5. Close the fuse holder by pressing it firmly back into place.
6. Reconnect the power cord to the VMU-1 and plug it back into the AC outlet.
7. Turn on the VMU-1 and check that it is functioning properly.

If you experience any issues with the VMU-1 after replacing the fuse, please consult a qualified electrician or contact RSE customer support for assistance. Never use a fuse with a different rating or type than specified by the manufacturer, as this can cause damage to the device and create a safety hazard.

## TUBE REPLACEMENT

The RSE VMU-1 has a fully balanced tube schematic which includes three types of tubes:

- (1) ECC85 - used as a vari-gain element
- (2) ECC99(6N6P) - used in output stage
- (3) ECC88(6N23P) - used in detector stage

These tubes are essential components of the device, and they need to be replaced periodically to ensure optimal performance.

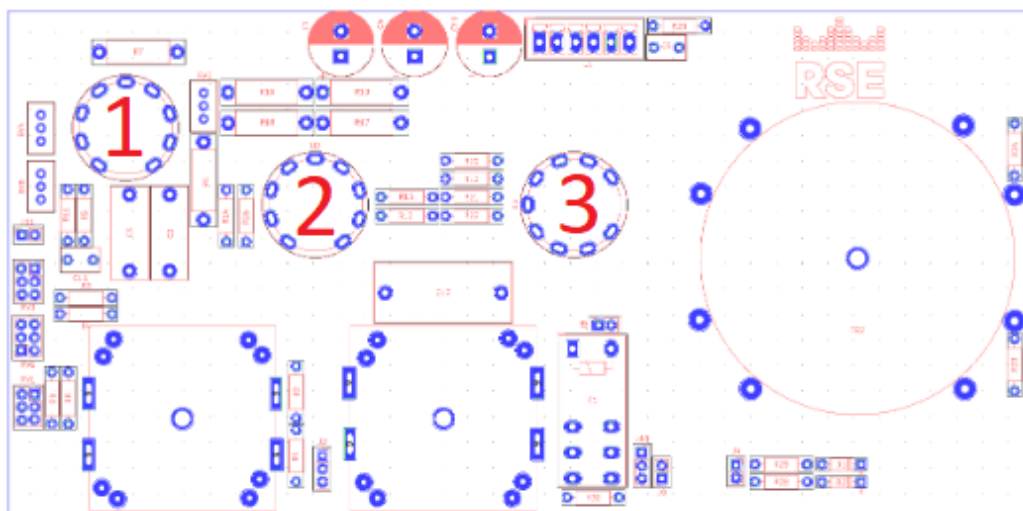
The frequency of tube replacement depends on various factors such as usage, environment, and the quality of the tubes. It is recommended to replace the tubes every 2-3 years for optimal performance. However, if you notice any issues with the sound quality or performance of the device, it may be necessary to replace the tubes sooner.

To replace the tubes in the VMU-1, follow these steps:

1. Turn off the device and unplug it from the power source.
2. Locate the tubes on the circuit board using the following map.
3. Remove the old tubes by gently pulling them out of their sockets. Be careful not to damage any of the surrounding components.
4. Insert the new tubes into their respective sockets, making sure they are seated securely.
5. Turn on the device and test it to ensure it is functioning properly.

*\*It is recommended to replace tubes in both channels at the same time, even if only one of them appears to be malfunctioning. This will ensure that both tubes are operating at the same level and will prolong the life of the device.*

*\*\*When selecting replacement tubes, it is important to choose ones that are compatible with the VMU-1 and have similar specifications to the original tubes. Contact the manufacturer for guidance on selecting appropriate replacement tubes.*



In summary, replacing the tubes in the VMU-1 is a straightforward process that can help maintain the device's performance and prolong its lifespan. By following these simple steps, you can ensure that your device continues to function at its best.

## SIGNAL CONNECTION

The RSE VMU-1 compressor is equipped with fully balanced XLR connectors for input and output connections. The use of XLR connectors is preferred due to their sturdy design and ability to provide a reliable balanced connection.

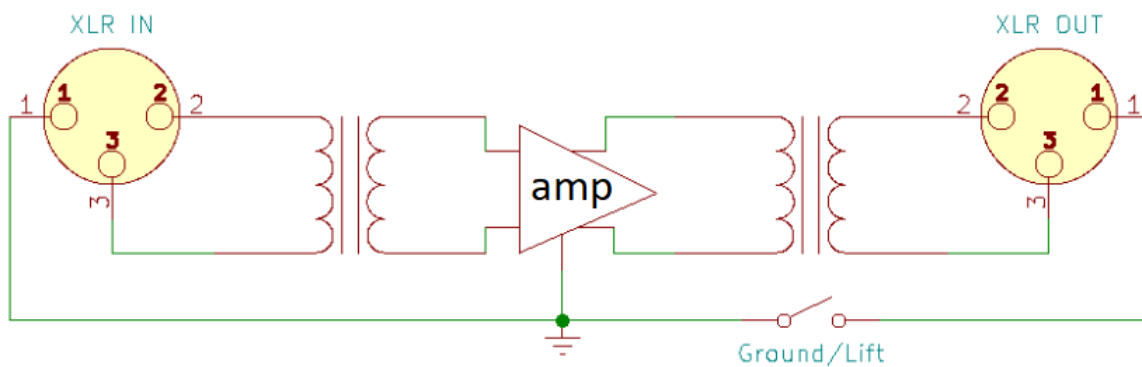
The standard color coding for XLR connectors is as follows:

pin 1 is typically ground/shield

pin 2 is hot/positive

pin 3 is cold/negative.

In the VMU-1 compressor, the XLRs are connected to the input and output transformers without the middle point. It is important to ensure that the correct pin assignments are used when connecting the VMU-1 to other audio equipment to maintain a balanced signal path. Pin 1 of input XLRs is connected to the main device's ground, while the output XLRs pin can either be connected to it or isolated, providing ground/lift function for each channel.



The expected signal level at the input of the device is +4 dB when the compression Gain knob is set to 0. It is important to pay attention to the Threshold and Ratio settings when using compression chains, as the output signal can reach high levels when they are not activated and the overall gain is set higher than 0dB. This can lead to overdriving and possible damage to your interface



## **INSTALLATION**

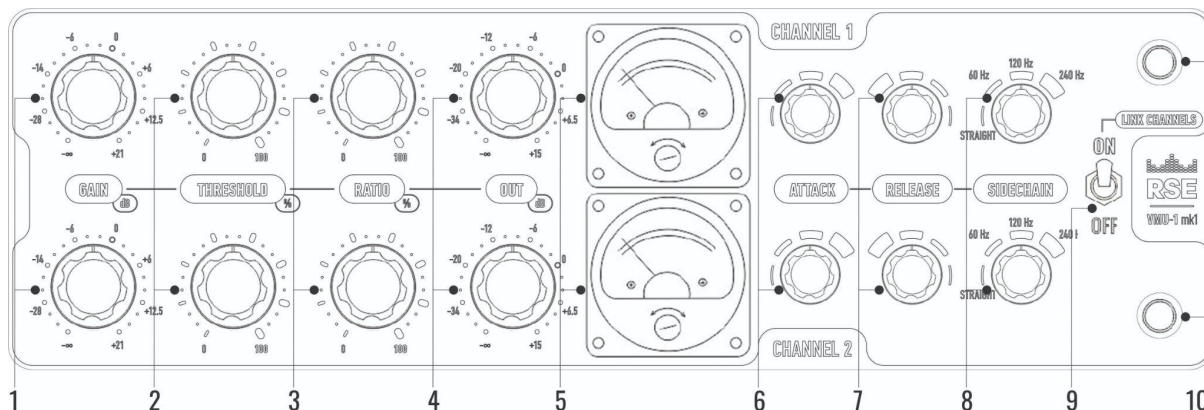
To install the RSE VMU-1 compressor into a 19" rack, follow these steps:

1. Ensure that the compressor is powered off and unplugged from any power source.
2. Remove any protective packaging or covers from the compressor.
3. Install the mounting ears to the VMU's main chassis using screws from a set.
4. Locate the mounting holes on the sides of the compressor. These holes should align with the mounting holes on the 19" rack.
5. Use screws and washers to attach the compressor to the rack. Make sure that the screws are tightened securely, but not too tight to avoid damaging the device or rack.
6. Once the compressor is securely mounted, connect the XLR input and output cables to the appropriate connectors on the device.
7. Connect the power cable to the compressor and plug it into a power source.
8. Turn on the compressor and test it to ensure that it is working properly. (Next chapter)

It is important to ensure that the compressor is mounted securely in the rack to avoid any damage or accidents. Also, make sure that there is enough space around the compressor for proper ventilation and cooling.

## OPERATIONAL NOTES & ADJUSTMENTS

The front panel of the RSE VMU-1 compressor is designed to provide easy access to all the necessary controls for adjusting the sound output.



The Gain (1) knob is used to adjust the input level of the signal, which can be increased or decreased depending on the desired output.

The Threshold (2) knob controls the point at which the compressor begins to reduce the level of the signal. This can be adjusted to achieve the desired amount of compression.

The Ratio (3) knob is used to adjust the amount of compression applied to the signal. Its counterclockwise position makes the compression effect equal to zero, so there is no compression at all. It works in conjunction with the Threshold (2) knob to determine the amount of gain reduction applied to the signal. The counterclockwise position of Threshold (2) moves the point of detection to the lowest level, so the compression effect appears earlier.

The Out (4) knob controls the overall output level of the compressor, allowing you to adjust the final volume of the signal.

Both the Gain (1) and the Out (4) knobs have “zero” position, what means that if these knobs are in this position, there is no compression, and the input signal is sinusoidal +4dBu, the output signal will be sinusoidal +4dBu as well.

There are two analog GR meters (5) on the front panel, which display the amount of gain reduction being applied to the signal in real-time. These meters are useful for monitoring the performance of the compressor and ensuring that it is working correctly. When there is no gain reduction at the moment, the needles are at 95% of the full scale. When the maximum gain reduction (~20dB) occurs, the needle goes to 5%.

The Attack (6) and Release (7) rotary switchers control the speed at which the compressor reacts to changes in the input signal. The Attack (6) controls how quickly the compressor responds to sudden increases in volume, while the Release (7) controls how quickly it returns to normal operation after a sudden drop in volume.

Attack time options: 2.2ms/17ms/32ms/47ms  
Release time options: 48ms/190ms/2.1s/4.8s

The Sidechain (8) switcher allows you to choose between different sidechain filters, which can be used to tailor the compressor's response to specific frequencies. The sidechain cut the frequencies in a way, that compressor doesn't reduce the signal on frequencies lower than mentioned. In other words, the detector "thinks" there is nothing to compress on the low side. The sidechain frequency options : FLAT/60Hz/120Hz/240Hz (-3dB)

Finally, there is a Link Channel switcher (9) on the front panel, which allows you to link compressors chains of each channel together for stereo operation. This switcher ensures that both compressors are working together in perfect sync, providing a smooth and consistent sound output.

The Power button and Power light (10) indicator are also located on the front panel, allowing you to easily turn on and off the compressor and monitor its status. Overall, the front panel of the RSE VMU-1 compressor is well-designed and intuitive, providing easy access to all the necessary controls for achieving the desired sound output.

## TESTING & TROUBLESHOOTING

### To check the device works correctly do next steps:

1. Set the Gain and Out knobs to the "0" positions
2. Set the Threshold knob to the extreme clockwise position (100%)
3. Set the Ratio knob to the extreme counterclockwise position (0%)
4. Turn off the link channel chain (bottom switch position)
5. Put the control (sinusoidal 1k +4dBu) signal from your source (e.g. DAW) to the VMU's inputs.
6. *\*Notice, that the line output of the DAW may have not the +4dBu level while it's tuned to the MAX volume in your software. Read your DAW specification to figure out how to tune it correctly. Quite often MAX output level of the DAW makes +18dBu signal on the output, so you have to set the output level -14dB, or set the VMUs GAIN knob to the -14dB position.*
7. You have to get the +4dBu signal to your signal receiver (e.g. DAW) input. The needle of VMUs GR meter shouldn't move noticeably.
8. *\*Notice, that the line input of your DAW may have not the +4dBu input, but +18dBu instead. So you'll get different value from expected 0dB. Read your DAW specification to figure out how to tune it correctly. Quite often the DAW returns 0db level while the real signal on its input is +18dBu. Add +14dB of the gain on your DAW, or set the VMUs OUT knob to the +15dB position. In this case you'll get +1dB input level in your software.*
9. Set the THRESHOLD to the 0% (counterclockwise) and the RATIO knob to the 100% (clockwise), Attack - fast, release - slow, sidechain - flat.
10. You'll find that the needle of GR meters moved left and the level in your signal receiver (e.g. DAW) input decreased for approximately 20dB. That means, that gain reduction occurs and compression itself takes place.
11. Mute one of your source's output signal. The GR meter's needle of the corresponding channel will move right to its initial position. Turn on the channel link switcher - the needle of GR meter will show that GR applies to this channel even, when the input signal is lower than threshold setting.
12. Change the test signal frequency to 50Hz. The GR meters needles doesn't move noticeably, that shows the flat frequency response. Switch the Sidechain selectors to the 120Hz - the needle will move right, that means that input signal is out of subject to compression frequency range.

In case you faced some issues, first check your setting, perhaps you set up something wrong and this is a reason of the device works not as expected. Also, some most often issues will be covered further:

1. **The device doesn't powers up** - Check your main voltage, if its varies more then for 20% of expected (*higher than 250V for 230V version or higher than 127V for 115V version*) the built-in protection will turn the device off. Also, check the fuse, perhaps it needed to be replaced ("FUSE REPLACEMENT" part of the user manual)
2. **There is no/weak output signal** - Check your signal connections. They should consider that the input and output of the VMU-1 are made with transformers without the middle point. So they are fully balanced and incorrect wiring can cause the signal loss. (see "SIGNAL CONNECTION" part of the user manual). Try to test the device as it's described above, if you still have some issues, don't hesitate to contact our support team.

3. **I believe, the tubes inside needed to be replaced. Which types I can use to do this? -**  
Please, notice, that all tubes inside are matched pairs and tube swapping can lead to the schematic's unbalancing, even while tubes have the same marking. Also, note that the plate voltage is dangerous, so it's not recommended to do it yourself. Please contact a qualified service for this. Our support team will be glad to assist them with all needed information. (see "TUBE REPLACEMENT" part of the user manual). Try to test the device as it's described above, if you still have some issues, don't hesitate to contact our support team.

**\*If you continue to have problems, please feel free to reach out to our support team for assistance via email at [support@rseaudio.net](mailto:support@rseaudio.net).**

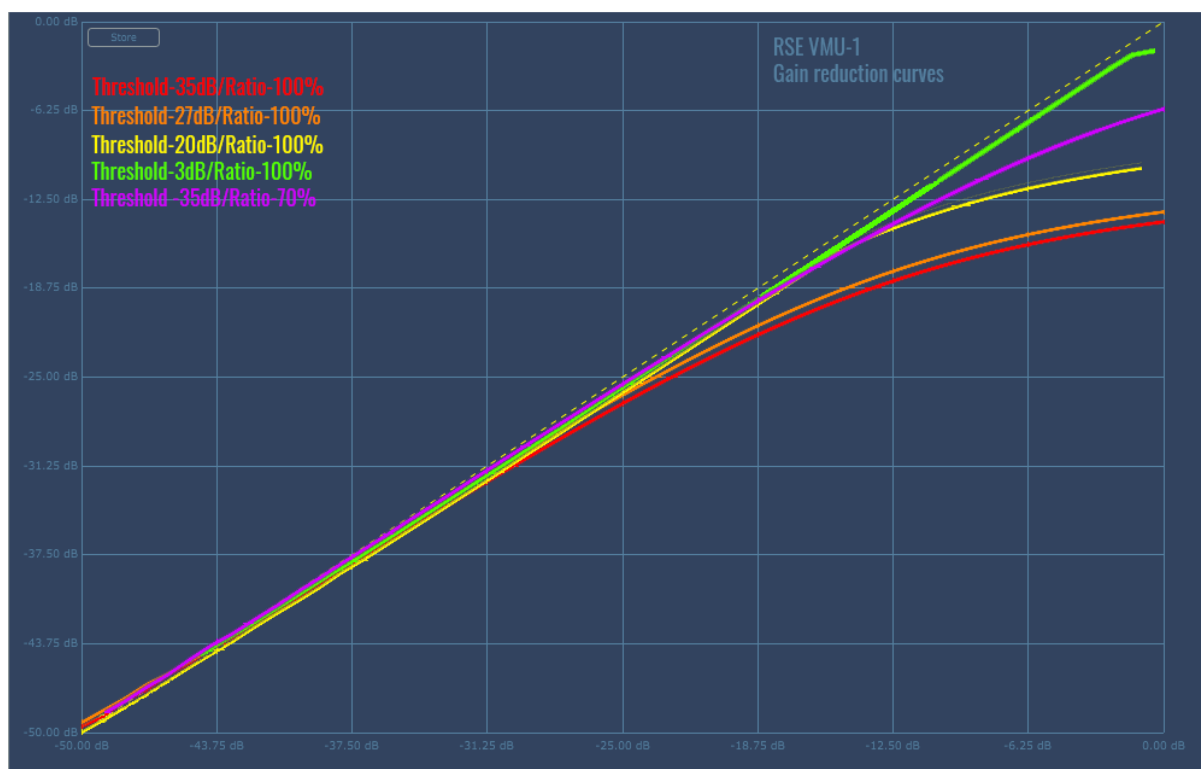
## GAIN REDUCTION CURVES

Soft-knee signal compression is a type of compression that gradually reduces the gain of an audio signal as it approaches a certain threshold. Unlike hard-knee compression, which applies a fixed amount of gain reduction once the threshold is reached, soft-knee compression offers a more gradual and natural-sounding reduction in volume.

One of the benefits of soft-knee compression is that it allows for greater control over the dynamics of a mix. By adjusting the threshold and ratio settings, users can achieve a more subtle or aggressive compression effect depending on their needs.

Another advantage of soft-knee compression is that it allows for higher compression rates without causing unwanted distortion or artifacts in the audio signal. This is because the gradual reduction in gain helps to smooth out any abrupt changes in volume, resulting in a more natural and pleasing sound.

Users can also achieve higher compression rates by increasing the input gain. For example, if the input level is boosted by +4dB and the gain is set to maximum, this will result in a higher compression ratio than if the input level was lower. However, it's important to be mindful of potential clipping or distortion when using high levels of gain.



Gain reduction curves while different Threshold & Ratio settings applied

**SPECIFICATIONS**

- Custom built amorphous-core RSE input & output transformers
- 20Hz-20kHz (+/-3dB) frequency response
- BALANCED INPUTS & OUTPUTS (600 Ohms)
- Fully differential ALL-TUBE circuitry using one each ECC85, 6N6P, ECC81 per channel
- Stabilized plate voltage
- Stabilized Heater voltage
- High overload capability (+10dBu/20Hz max)
- Attack time options: 2.2ms/17ms/32ms/47ms
- Release time options: 48ms/190ms/2.1s/4.8s
- Variable Ratio (1:1 - 1:20)
- HP Side Chain Filter: FLAT/60Hz/120Hz/240Hz (-6dB/Oct)
- Rare analog GR meters
- STEREO LINK SWITCH
- Maximum gain: 36dB
- Power Consumption (120/240VAC): 110 watts - Unit is factory set for 115 or 230 VAC
- Mains overvoltage/undervoltage protection
- Mains Voltage Frequency: 50~ 60Hz
- Dimensions: 19" x 3U.
- Shipping Weight: 7 kg.