Rapselecta™

Rapaudiology™ VUs

OWNER'S MANUAL

Ver. 1
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Introduction:

This stereo analog VU metering unit was designed for users that want to complement their DAW's LED peak meters with a pair of analog VUs for measuring average loudness levels during the mixing and mastering phases of audio. The idea was born after I added a pair of VUs to my monitoring setup and realized that I wanted a more flexible way of calibrating them than the units I had found available commercially. They are intended to be placed across the outputs of a balanced pro audio line level interface, preceding a monitor controller. The unit features a JLM Audio stereo buffer amplifier that will prevent noise coming back into the signal from the meters.

The meters were designed with flexibility in mind. With three independent, user definable positions that allow the user to calibrate 0 VU to be anything that falls within the meters' specified range (the range is set by two trim pots inside the unit). They can be calibrated to fixed and non-fixed decibel values using the traditional method of feeding a 1kHz tone or by feeding reference program material.

Don't let the professional look of the meters and this manual fool you, these are not mass produced units! Each one is hand crafted by yours truly using high quality components, then carefully painted and tested. The controls are labeled with custom decals and each unit has its own serial number. Think of this as something you would have a professional audio tech build for you (except this looks a lot nicer than what a typical audio tech could put together, most of them aren't this artistic!) This manual is for the "standard" version of the Rapaudiology VUs. Custom built units will vary slightly with other options and features.

After working with my unit on several projects with different loudness targets, I believe other audio engineers will find these helpful for monitoring average loudness alongside peak meters. Of course, your ears are the most important tool in your arsenal for audio work, but that doesn't mean you can't have a pair of cool looking, useable analog VUs. They're definitely cooler (and way more useful) than any lava lamp or other visual studio accessory could ever hope to be.

L. Franco
Redsecta Mastering

Functions:

1. Power Switch
2. Left/Right Meter Zero Adjustment
3. Left/Right Calibration Pots
4. Left/Right Position Switches
5. Left/Right Input & Thru
6. Power Connector

1. Power Switch

Meters and their lights are either on, or not. Signal passes through to outputs (labeled "thru") even when the unit is switched off.

2. Meter Zero Adjustment

Use a small flat head screwdriver (⅛") to adjust each meter's needle balance screw if needed. The only reason to adjust this screw is if the needles are not resting at -20 on the scale.

3. Calibration Knobs

Select a position you want to calibrate/monitor by selecting its position on the switches at the rear (both switches have to match positions for the meters to work). The unit has been pre-calibrated on a +4dBu interface with a 1k tone and the lowest internal range is set at the NTSC standard, which is: 0 VU = -20dBFS (RMS). This will usually cover the average (RMS) loudness levels of most modern mixes and masters. Turning the calibration knobs to the far right will be -20dBFS (RMS), while turning it all the way to the left will be "off" (no signal). Refer to the "Calibrating the Meters" section on page 6 for calibration instructions. Note: Feeding a signal lower than -20dBFS will not register movement on the meters.

If desired, it is possible to increase the range of the meters even further by adjusting the two internal trimmers (accessible by removing the top cover) on the buffer amp. They are marked "L" and "R". Make sure you have a voltage meter capable of reading true RMS at 1,000 cycles (1kHz) and turn the trimmers clockwise to match both channels.

Before adjusting the internal trimmers, unplug the power adapter to the unit and turn it on, then off to discharge a small capacitor inside the unit (this capacitor has been sealed and its leads will not be exposed, but regardless, always practice good safety when working with electronics).

4. Position Switches

Set which calibration point is active on the meters. Both switches must match position for the unit to work.

5. Input & Thru

The connections are balanced XLR (pin 1= shield, pin 2= hot, pin 3= cold) however, the meters will work with unbalanced connections (pin 1=shield, pin 2= signal).

Signal passes from inputs to "thru" outputs even when the unit is switched off (hard bypass).
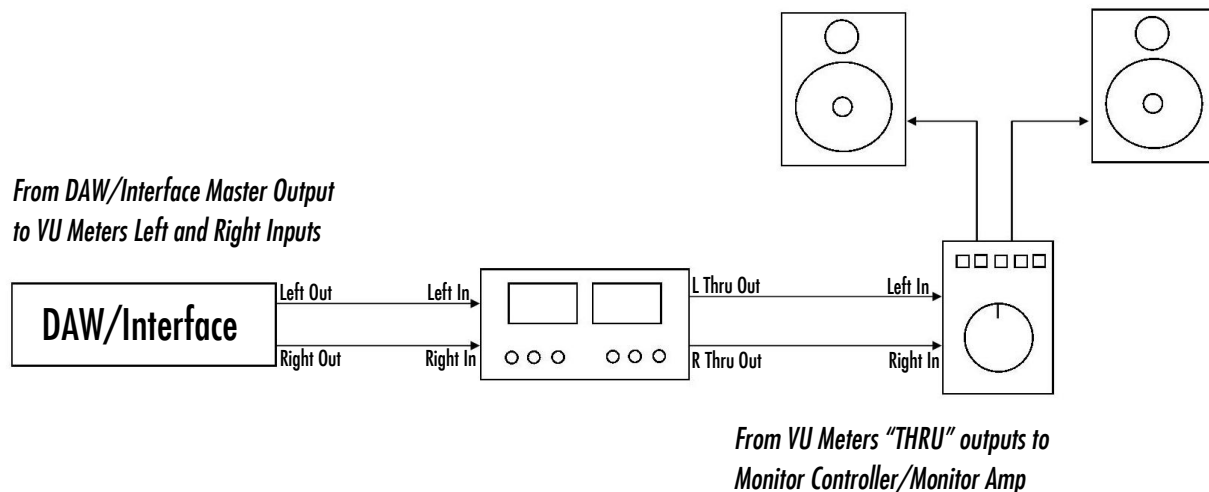
6. Power Connector

The unit is powered by a 12 volt DC plug pack. If replacement is necessary, make sure the new plug pack's connector supplies + (positive) to the tip, - (negative) to the sleeve.

Analog VU meters and RMS

Mechanical VUs give an *approximation* of voltage level RMS (Root Mean Square). When feeding them a sine wave tone, VUs will display RMS accurately since the signal isn't complex. When feeding VUs with a complex signal (audio), they become less accurate and display a slightly lower value than true RMS. Today, there are more accurate digital loudness meters than analog VUs for measuring average loudness of stereo material, but they're still useful for many audio engineers because they're mechanical. The movement of a VU needle is easier on the eyes than a metering plug-in or LED meter. Studying the needle's relation to 0 VU on the scale, how far back it falls and how fast it recovers back to 0 VU gives you a visual approximation of dynamic range. Material with a wide dynamic range tends to move the needle back & forth more than material that has a narrower range of dynamics.

Connecting the Meters

If a dedicated line source output is not available for the meters, connect them before your monitor controller/monitor amplifier as shown:

*From DAW/Interface Master Output
to VU Meters Left and Right Inputs*

DAW/Interface — Left Out → Left In — | L Thru Out → Left In — Right Out → Right In — | R Thru Out → Right In

*From VU Meters "THRU" outputs to
Monitor Controller/Monitor Amp*

Calibrating the Meters

The main idea behind the design of these meters is that 0 VU can be set to whatever the user feels is useful for measuring average loudness of mixes and masters, and sometimes that includes calibrating the meters based on a reference track. This idea takes precedence over maintaining fixed resistance for the sake of keeping the VUs mechanically up to spec. However, If the user wants to calibrate the meters based on a standard, like 1.223 Volts (+4dBu) or 0.775 Volts (0dBu) it is still possible to do so and be able to keep that position's calibration as the meters use very stable, high quality potentiometers for calibration.

Calibrating the unit using 1kHz sine wave tones:
If you don't already have a full scale 1kHz tone (0dBFS), you can download one here:
www.redsecta.com/1ktone.zip

1. Import the 1kHz tone audio file to an audio track in your DAW. **Important:** make sure your monitors are turned off or way down, you don't want to play this tone at unity gain on them.
2. Bring the tone track's fader all the way down.
3. Copy the tone track to two new audio tracks (to calibrate positions 2 and 3 later). Mute both new copies.
4. Insert a peak meter in your DAW's master output fader.
5. Select both position switches to position 1
6. Press play on your DAW and bring up the tone track's fader while looking at your peak meter. Stop where you want to set the position's calibration point (we'll use -18dBFS for this example). Name the track "-18dBFS".
7. Adjust both meters' calibration 1 pots until the needles of each meter raise to 0 VU. You just calibrated the first position.

Repeat steps 5 - 7 for positions 2 and 3. Save this DAW session to something like "VU Calibrations" to go back to if needed, or to add more calibration reference tracks later.

Calibrating using reference tracks:
If you're interested in calibrating the meters to the average level of a reference track, perhaps to use as a target loudness for your own work, you can do so by following the above steps (you'll be using a reference track instead of the 1kHz tone file), except for step number 6:

Instead of bringing the fader up, leave the reference track at unity and turn the calibration knobs all the way down for both meters (counterclockwise). Focus on a busy section of the track, like the chorus, and loop it. Adjust the knobs until the needle is peaking as close to 0 VU as possible. The

needles may occasionally go over 0 VU during sections that have more energy, like a sustained 808. Keep in mind that often times, one channel will have more energy than the other, so both meters will be off slightly when you compare your settings against the 1kHz tone. Another thing to keep in mind is that material with more low frequency energy and slower transients will drive the needles on the VUs more than material with higher frequency content and fast transients, which is often perceived as louder than material that is more bass heavy. Use sources that have a good amount of frequency balance.

Load up the 1kHz tone in your DAW and increase the gain until the needles raise to 0VU. More than likely, only one of the meters will be at 0 VU while the other will read slightly over or under 0 VU since one of the channels might have had a bit more energy than the other. If this is the case, compensate by increasing/decreasing the gain of the 1kHz tone so that 0 VU is "between" the left and right meters' needle.

Calibrate both channels so that they're at 0 VU. You now have an average of the approximate RMS of the source track.

Care & Maintenance

Mechanical VUs have sensitive electronics that will likely be damaged if the unit is dropped. The rubber feet that come on the unit will help keep the unit from sliding around most surfaces, but care should be taken on where the unit is placed. Place the unit in an area where its wires won't be tripped, resulting in the unit flying off from where it's been placed. Besides that, a good dusting every now and then would be good.

Limited Warranty

Each unit is a unique functional work of art, but that doesn't mean we're going to leave you hanging if it fails you within one year of purchase. All parts on the unit are covered, except the power adapter. If the unit does not power on, test the power adapter first with a voltage meter; if the power adapter is faulty, you'll be able to replace it cheaper than what it would cost to ship the unit back to us. If something has malfunctioned inside the unit, send it in (you pay for shipping it our way, make sure you insure it) and we will repair it and ship it back to you at no charge. This limited warranty is void if you kill the unit by dropping it on the ground or damage it with liquids. Visible damage to the case will also void the warranty.