ADC Professional Products Group

a division of BSR (USA) Ltd., Route 303

Blauvelt, New York 10913

OPERATING INSTRUCTIONS

SLM-100 SOUND LEVEL METER

The SLM-100 sound level meter used with your frequency equalizer permits you to adjust the frequency responses of your hi-fidelity system including the speakers and the room which up until recently have not been considered part of the system. To appreciate the importance of the room consider that Lincoln Center spent millions of dollars in reconstructing the hall acoustics because the first design did not achieve the desired effects. The concert hall had to be matched or coupled to the stage in the same way that your speakers and hi-fidelity system must be matched to your room. The equalizer will allow you to compensate for deficiencies in the speakers, as well as, allow for the furniture, i.e., chairs, drapes, etc., in your room.

Your equalizer can be used simply to adjust the sound the way you like to hear it best or with the use of the SLM-100, to adjust it for flat response. Following the procedures given below should result in a new understanding of your room, speakers, and hi-fidelity equipment, as well as, allow you the freedom of being your own sound engineer.

SPECIFICATIONS

Range: 60 to 116dB in 5 ranges:

Switch setting:		
	70dB	60 to 76dB
	80dB	70 to 86dB
	90dB	80 to 96dB
	100dB	90 to 106dB
	110dB	100 to 116dB

Accuracy: ± 3.5dB 30–16Khz (with corrections included)

Standard: 0dB = .0002 dynes-per-square-cm.

Meter Ballistic Characteristics: Fast to ASA standards (switch selected)
Slow for average levels.

Output Jack-Voltage: 1V min @ 1 Khz

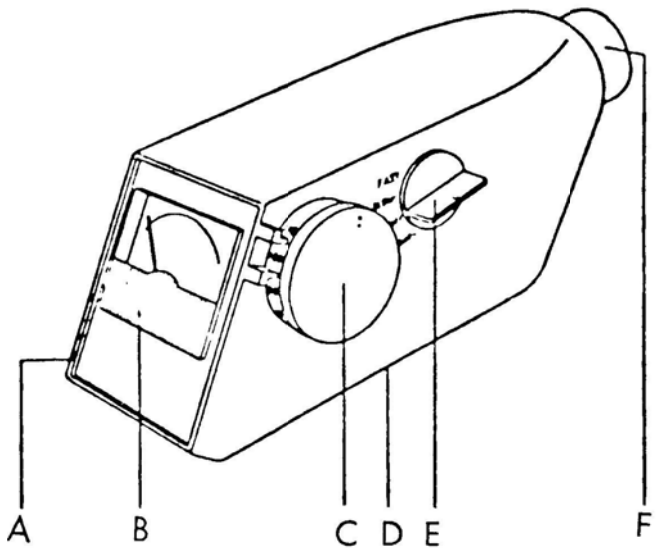
Response:	30 to 16000hz
Impedance:	10K Ω min. load
Distortion:	less than 2% at 1 Khz, .5V output

Battery: 9 Volt Eveready No. 216 or equivalent
(Battery will test good from 7.5 to 9.5 V DC)

Microphone: Dynamic, Omnidirectional, Becoming slightly directional with increase in frequency.

Similar to Western Electric 640AA type, making calibration possible with commercially available standards.

Location of controls and design features:



A. Output jack (phono type) (far side)
B. Meter and battery condition indicator
C. Range selector
D. Battery compartment (underside)
E. On-off switch and mode selector
F. Microphone

OPERATION

Battery Installation and Replacement

To install the battery, remove the battery compartment lid D and clip in a 9V rectangular battery (Eveready No. 216, Burgess 2U6, RCA VS 323, Mallory M160Y, or equivalent). For long battery life, the mode switch E should always be OFF when your sound level meter is not in use.

The battery condition should be checked every time the meter is to be used as the meter will **not** be accurate if the battery voltage is low.

To test the battery, turn the mode switch to the BAT position. The meter should now read in the area marked BAT on the scale. If the meter is not in this area, the battery should be replaced.

If the meter is to be stored for a long period, the battery should be removed.

Sound Level Measurements - Controls

Range Switch: Switch C is the range selector and determines what the meter B actually indicates. There are 5 positions on the switch marked 70, 80, 90, 100, and 110. These refer to the level (in dB) that the meter indicates at 0. The other meter scale markings subtract to the left of 0 and add to the right of 0.

Examples: With the range switch set at 80, the meter reads 4. The level is thus 80 +4 = 84dB. If the meter read 0, the level would be 80dB and if it read –4, the level would be 80 - 4 = 76dB.

For greatest accuracy, the highest - up scale - meter readings should always be used. If you were set to 80dB and the meter read –6 (74dB) the range switch should be reset to 70 and the meter would then read 4 (74dB).

To protect the meter, always start at the high range (110dB) and work downward.

Mode Switch: The mode switch E turns the meter on when turned from off to either the FAST or SLOW positions. These positions control the meter reaction to sound changes as follows:

FAST: In this position the meter will react quickly to changes in sound level. The FAST position is almost like a "music power" indication as the meter will respond at the rate most amplifier's music power specifications are based on. This position agrees with ASA standards and is equivalent to the way the human ear hears. The meter will not overshoot in the FAST mode over 1 dB.

SLOW: In the SLOW position, the meter is damped and it indicates an "average value". This average value is the most useful for music measurements as the extremely short duration peaks are eliminated and the meter can be kept on scale.

In the OFF position, the battery is disconnected.

Output Jack: A phono type (RCA) output jack is also provided which allows the user to use the instrument as a high quality microphone, or in conjunction with the ADC-500 Professional Frequency Equalizer (see special instructions on page 5).

When used as a microphone for recording, a phono plug cable should be plugged in the output jack and into the line input of the recorder and the range switch should be placed one position greater than for meter viewing. This will prevent the amplifier from clipping under sudden high levels and will cause less visual meter motion.

High impedance headphones can also be connected to this jack as can an oscilloscope or distortion analyzer.

USING YOUR SOUND LEVEL METER

General Procedure:

1. Position the Sound Level Meter (SLM) approximately where your ears would normally be with the microphone facing the speakers.
2. Set the SLM power switch to "Slow" position and the range switch to 80, all tone controls, high-low filters, contour switch, etc. should be in the flat or out position.
3. The Equalizer should be in the out position or all the slide controls set at "0"dB.
4. Play the first band on the test record, and set volume control until the SLM reads "0"dB.
5. Play the balance of the record and note the meter readings of the SLM (if the meter goes off scale, reset range switch) add 10dB to the 30hz and 16000hz readings.
6. Review the readings noted in step 5, note the highest and lowest readings add these readings and divide by 2.
7. Review the readings in step 5 again and find the **frequency** which gives a meter reading closest to the figure calculated in step 6.
8. Replay that frequency on the test record again and set the volume control so the SLM reads "0"dB on the 80dB scale of the SLM.
9. The Equalizer should now be in the "IN" position.
10. Now replay the test record again and adjust the slide controls so that all frequencies except 30hz and 16000hz get as close to "0"dB on the SLM as possible. 30hz and 16000hz should be adjusted to read −10dB on the meter. (−10dB is 80 − 10 or 70dB).

NOTE:

The Equalizer range is ± 12dB and can only compensate for a maximum difference of 24dB. You may not be able to fully compensate the system.

SPECIAL INSTRUCTIONS FOR THE ADC-500 FREQUENCY EQUALIZER

Included with the SLM-100 Sound Level Meter and Pink Noise Record accessories is a 20 foot audio cable fitted with RCA type phono plug and standard phone plug.

Connect the RCA type phono plug to the sound level meter jack marked "OUTPUT" and the standard phone plug into the jack marked "SLM" on the front panel of the ADC-500 frequency equalizer.

The right channel output meter on the ADC-500 will now respond to the sound level meter readings. By following the general procedure on page 4 and adjusting the meter control located below the right channel meter, the meter readings on both SLM and frequency equalizer can be made to coincide.

When both meters read the same do not disturb the setting of the meter control. The range selector on the sound level meter correspondingly affects the reading on the right channel meter of the equalizer. Proceed with instructions under "General Procedure" items 1 through 10, observing the reading of the meter on the frequency equalizer.

SPECIAL INSTRUCTIONS FOR THE ADC-300

1) The ADC-300 incorporates two (2) meters which should be used to check the response of the cartridge and pre-amplifier before proceeding with the room equalization. (See instructions included with the ADC-300 for the procedure used.)

2) The meter on the ADC-300 can also be used in step 10 of the General Procedure. This will allow you to adjust the Equalizer for a flat response while viewing the meters on the ADC-300 instead of having to look at the meter on the SLM. This procedure is as follows:

A. Reconnect the ADC-300 as follows:

1. Disconnect your tape recorder.
2. Plug the leads that are in the output jacks on the ADC-300 into the tape output jack on the ADC-300.
3. Run a shielded lead from the jack on the SLM and plug into the output jack on the ADC-300. If a Y connector is used the SLM can be plugged into both output jacks simultaneously.

B. Depress the EQ-Record, monitor and meter buttons on the ADC-300. The Equalizer bypass switch should be in the out position.

C. Repeat steps 1 through 8 in the General Instructions, making sure that in step 8 the SLM reads 0dB on the 80dB scale on the SLM. Then adjust the meter level control on the ADC-300 so that the meters on the ADC-300 read 0dB.

Now the meters on the ADC-300 are calibrated to the SLM. Following step 10 now using the meters on the ADC-300, adjust the slide controls so that all frequencies except 30hz and 16000 hz get as close to "0"dB as possible. 30hz and 16000hz should be adjusted to read −10dB on the ADC-300 meter.

Technical Information – And Other Uses

dB Explanation

In order to get the maximum value from your sound level meter, it is important that you understand the unit of sound intensity, the decibel.

The decibel has no actual numerical value but is used only to express a ratio between two powers, voltages, currents, pressures or other basic units. The equation for finding this ratio is:

$$dB = 10 \log_{10} \frac{P_1}{P_2}$$

where P = power or any other unit. Because the decibel is just a ratio, it is used for many purposes other than sound level measurements and its use in other ways should not be confused with the way it is used with the sound level meter.

One of the common uses of dB notation is in amplifier and other equipment specifications and an understanding of this use will help understand the sound level use. If an amplifier has a rating of 20 to 20,000hz ± 1dB, it means that the output power can vary over that frequency range by ± 1dB. Assume that the amplifier is at 10 watts at 1,000 hz and can vary ± 1dB. You can figure out the power output limits with a log chart as follows:

$1dB = 10 \text{ Log}_{10} \frac{P}{10}$ (where P is the power at +1dB or $.1 = \text{Log}_{10} \frac{P}{10}$ A logarithm chart will show that the logarithm .100 is 126 so P = 12.6 watts.
−1dB is found by finding the logarithm .9 which is 79.4 or 7.94 watts.

This shows that a small change in dB gives a big swing in power as this is a logarithmatic scale. +3dB in watts is actually + 100%. 10dB is the difference between 1 watt and 10 watts and 100 watts.

This might seem like an odd way of measuring until the human ear is considered. Actually the human ear can perceive over a wider range than almost any other human sense and has a far wider range than the eye. If you assume that 0dB is the threshold of hearing, the ear will not overload (a sensation of pain rather than hearing) until +130dB or a ratio of 3,000,000 to 1. The ± 1dB makes a lot of sense since the ear can only detect changes of 2dB or more. In other words, if the 10 watts above were driving a speaker, you could not hear the difference if the output was varied from 8 watts to 12.6 watts.

As used on your sound level meter, dB does show a ratio but a ratio based on a standard of pressure. This standard is about the threshold of hearing and is defined in sound pressure so that 0dB = .0002 dynes/cm^2. (This is explained in most textbooks on sound but for our purposes 0dB is simply that point at which the ear begins to perceive sound.)

Thus a sound level meter is very related to human hearing and is quite usable in determining how sounds will affect people. Some loudness levels of common sounds are:

Rustle of leaves	10dB	Loud music (classical)	80dB
Whisper at 5′	20dB	10 hp outboard motor at 50′	87dB
Country house	30dB	Very loud music (classical)	95dB
Average house	45dB	Riveting machine at 35′	100dB
Average office	57dB	Thunder	107dB
Average conversation	65dB	Loud music (rock)	115dB
Average factory	75dB	Threshold of pain	130dB
Heavy traffic at 25′	75dB	Turbojet engine	175dB

Long listening at levels over 105dB or less, depending on the individual, can permanently damage the hearing and the greater the level, the faster the damage.

Many factors determine loudness and distance from the source is a major one. As an example, the heavy street traffic in the chart above that is 75dB at 25′ will be 85dB at 5′. Another factor in perceived level is the frequency of the sound. The human ear is far from "flat" in frequency response and while you can perceive sound at + 10dB from 200 to 10,000 hz, a 50hz note will not be heard until +50dB and 20hz until +70dB. This is the basic reason that low volume music sounds bad to the ear and your sound level meter can prove that there is sound there although you may not hear it. You can also see that high power amplifiers have a place when you realize that doubling a 10 watt amplifier will only increase the sound level 3dB.

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