AudiTon Microphone amplifier MA3

The AudiTon microphone pre-amp MA3 has been designed mainly for high quality speech recording. The unit comprises two independent pre-amps with output volume controls. This features the avoidance of signal clipping due to overloading the inputs of the recording devices. The maximum output voltage of 12 dBu provides for a sufficient level for professional line inputs (e.g. 4 dBu).

The frequency range (70 … 18000 Hz) has been limited at the low range to avoid the mostly large background noises which have no components in the speech frequency range. At the high end the range has been somewhat limited to avoid the possible sample noise, generated by some ADC's in recording equipment or sound inputs of computers (e.g. caused by inappropiate filtering).

The (transformerless) pre amplifiers have very low self-noise (-130 dBu). When a microphone is used with a sensitivity of only 2 mV/Pa, the signal to noise ratio (S/N) of the amplifier itself amounts to 81 dB at a SPL of 1 Pa. (When using a microphone of, for example, 10 mV/Pa this S/N becomes about 95 dB.) These values do not take into account the thermal or electronics noise from the microphone used. When a passive dynamic microphone of 2 mV/Pa with an impedance of 200 Ω is used, the thermal noise is about 260 nV. This means that the microphone itself has an S/N of 78 dB at a SPL of 1 Pa. The combined S/N is then 75 dB.

The phantom power needed for some types of condensor microphones is available: it can be switched on for each pre-amp separately. The voltage is limited to 12 V, which does not meet the official standards (24 V or even 48 V), but most modern phantom-powered mics are very tolerant about this voltage.

The calibration tone

In practice when sound is recorded, the recording volume level of the recording device is adjusted for optimal use of its amplitude range (while taking care to avoid clipping of the peaks). Usually, the relation between the acoustic sound pressure level (SPL) and the waveform amplitude presented afterwards has been lost because the exact amplification factors are unknown: in practice, all volume controls, input sensitivities, etc. are uncalibrated.

The AudiTon microphone pre-amplifier MA3 features a sound level reference for calibration of the 'original' acoustic sound pressure level (SPL) at the position of the microphone. As long as the green button on the amplifier is pushed, the microphone signal is replaced with a generated sine wave of approx. 800 Hz. The level of the calibration tone is equivalent to 1 Pascal (or 94 dB) when a microphone of 2 mV/Pascal is used.

The calibration tone's level with respect to the acoustic SPL is independent of the volume control position of the pre-amp and the recording level of the recording device: the microphone signal and the calibration tone signal levels are equally altered by all volume controls, which don't alter their level *ratio*. The calibration sine wave, afterwards displayed in the waveform used as a reference, offers the possibility to estimate the **absolute** acoustic intensity contour of the recorded sound.

After (re-)adjustment of the recording level or changing the volume control on the pre-amp, the calibration button should be pushed (again) to be able to provide for a new marker with the proper calibration level in the next recording. In this way the absolute acoustic levels of all parts of the recording can be estimated afterwards.

As an example, when a sound editor displays the reference tone part in the waveform to have an intensity of 81 dB, all intensity levels of the signal's waveforms have to be corrected by 94 – 81 dB = +13 dB.

When microphones with different sensitivities are used the calibration tone's level can be computed by the formula:

$$L_{CAL} = \frac{2}{S_M}\ Pascal$$

where S_M represents the microphone's sensitivity in mV/Pa.

For example, when the mic's sensitivity is 7 mV/Pa the calibration tone will have a level of 2/7 Pa (or about 83 dB). In case of a microphone of 1.6 mV/Pa, for example, the calibration tone will have a level of 2/1.6 Pa (or 96 dB). In the first case, when the intensity of the calibration tone is displayed as, for example, 88 dB, the correction of all displayed intensities of the signal should be 83– 88 dB = -5 dB. In the second case, when the intensity of the calibration tone is displayed as, for example, 80 dB, the correction of all displayed intensities is 96 - 80 dB = +16 dB.

Of course, the tone can also be applied to place markers in the recordings to define the beginnings of specific parts.

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Specifications

Unit contains two independent microphone pre amps. All controls can be applied separately.

Features per pre-amp:

Frequency range:	70 … 18000 Hz (-3 dB cross-overs)
Inputs:	balanced, XLR connectors
Phantom powered, 12 V, switchable	
Input impedance:	4.5 kΩ
Equivalent input noise:	-130 dBu
Max. input level:	140 mV (-15 dBu)
Outputs:	Line level, adjustable, 0 … 3V (12 dBu)
Output impedance:	50 Ω, unbalanced, cinch connectors

General:

Calibration tone:	± 800 Hz sine wave, ref. 2 mV (-52 dBu) at inputs
Power supply:	100 … 240 V, 50 .. 60 Hz