Mic Preamp Input Impedance

A major element of the sound of a mic pre is related to the interaction between the specific microphone being used and the type of mic preamp interface technology it is connected to. The main area in which this interaction has an effect is the level and frequency response of the microphone, as follows:

Level

Professional microphones tend to have low output impedances and so more level can be achieved by selecting the higher impedance positions of the ISA One mic preamp.

Frequency response

Microphones with defined presence peaks and tailored frequency responses can be further enhanced by choosing lower impedance settings. Choosing higher input impedance values will tend to emphasise the high frequency response of the microphone connected, allowing you to get improved ambient information and high end clarity, even from average-performance microphones. Various microphone/ISA One preamp impedance combinations can be tried to achieve the desired amount of colouration for the instrument or voice being recorded. To understand how to use the impedance selection creatively, it may be useful to read the following section on how the microphone output impedance and the mic preamp input impedance interact.

Switchable Impedance: In Depth Explanation

Dynamic moving coil and condenser microphones

Almost all professional dynamic and condenser microphones are designed to have a relatively low nominal output impedance of between 150Ω and 300Ω when measured at 1kHz. Microphones are designed to have such low output impedance because the following advantages result:

They are less susceptible to noise pickup They can drive long cables without high frequency roll-off due to cable capacitance The side effect of having such low output impedance is that the mic preamp input impedance has a major effect on the output level of the microphone. Low preamp impedance loads down the microphone output voltage, and emphasizes any frequency-related variation in microphone output impedance. Matching the mic preamp resistance to the microphone output impedance (e.g. making a preamp input impedance 200Ω to match a 200Ω microphone) still reduces the microphone output and signal to noise ratio by 6dB, which is undesirable.

To minimise microphone loading, and to maximise signal to noise ratio, preamps have traditionally been designed to have an input impedance about ten times greater than the average microphone, around 1.2kΩ to 2kΩ. (The original ISA 11 0 pre-amp design followed this convention and has an input impedance of 1.4kΩ at 1kHz.) Input impedance settings greater than 2kΩ tend to make the frequency-related variations of microphone outputs less significant than at low impedance settings. Therefore high input impedance settings yield a microphone performance that is flatter in the low and mid frequency areas and boosted in the high frequency area when compared to low impedance settings.

Ribbon microphones

The impedance of a ribbon microphone is worthy of special mention, as this type of microphone is affected enormously by preamp impedance. The ribbon impedance within this type of microphone is incredibly low, around 0.2Ω, and requires an output transformer to convert the extremely low voltage it can generate into a signal capable of being amplified by a pre-amp. The ribbon microphone output transformer requires a ratio of around 1:30 (primary: secondary) to increase the ribbon voltage to a useful level, and this transformer ratio also has the effect of increasing the output impedance of the mic to around 200Ω at 1kHz. This transformer impedance, however, is very dependent upon frequency - it can almost double at some frequencies (known as the resonance point) and tends to roll off to very small values at low and high frequencies.

Therefore, as with the dynamic and condenser microphones, the mic preamp input impedance has a massive effect on the signal levels and frequency response of the ribbon microphone output transformer, and thus the ‘sound quality’ of the microphone. It is recommended that a mic pre-amp connected to a ribbon microphone should have an input impedance of at least 5 times the nominal microphone impedance.

For a ribbon microphone impedance of 30Ω to 12 0Ω, the input impedance of 600Ω(Low) will work fine. For 12 0Ω to 200Ω ribbon microphones, the input impedance setting of 1.4kΩ(ISA 11 0) is recommended.

Impedance Setting Quick Guide

In general, the following selections will yield these results:

High mic pre-amp impedance settings

will generate more overall level

will tend to make the low- and mid-frequency response of the microphone flatter

will improve the high-frequency response of the microphone.

Low pre-amp impedance settings

will reduce the microphone output level

will tend to emphasise the low- and mid-frequency presence peaks and resonant points of the microphone