

Technical Information

Acquisition Modes of EPC 9, EPC 10 and EPC 10 PLUS

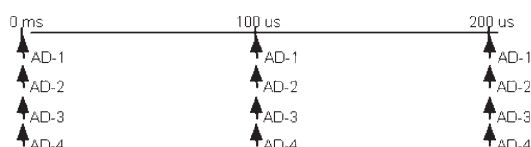
The three acquisition boards ITC-16, LIH 1600 and ITC-18 used in the HEKA amplifiers have three different acquisition modes. These modes are forced upon us by the price and complexity of the required hardware to achieve optimal performance with the chosen hardware.

We distinguish the following 3 basic acquisition modes:

1. cophasic (or simultaneous) acquisition
2. staggered acquisition
3. interleaved acquisition

Cophasic Acquisition EPC 10 PLUS using ITC-18

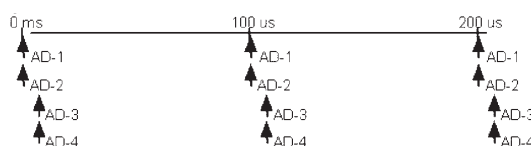
The EPC10 PLUS uses the ITC-18 to achieve cophasic acquisition on all input and output channel. In the cophasic acquisition, the acquisition board samples all AD-channels at once, and all DA-channels are simultaneously updated to their new output values. Thus, there is no time delay between the different ADC-samples and no delay between setting a DA-channel and acquiring its corresponding AD-channels.



Cophasic acquisition is the most desirable behavior of an acquisition board, but it requires the most hardware support and, therefore, is the most expensive technology.

Double Staggered Acquisition EPC 10 using LIH 1600

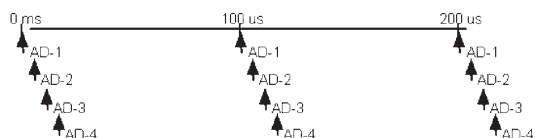
The EPC 10 has an LIH 1600 built-in which uses the double staggered acquisition mode.



To support cophasic acquisition of the two most relevant signals, e.g. the current and voltage trace of the amplifier, two AD-converters are used in parallel. That design results in supporting cophasic acquisition for 2 AD-channels. Also, there is no time delay between two DA-channels firing and the time of acquisition of two 2 cophasic AD-channels. In the design of the LIH 1600, time delays of 5 microseconds per pair of AD-channels will occur, when acquiring more than 2 AD-channels.

Staggered Acquisition

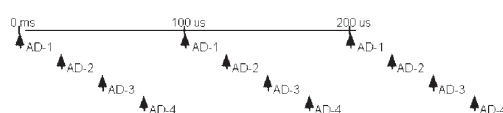
In the staggered acquisition the AD-channels are acquired one after the other as quickly as the hardware can support. Also the DAC are stimulated as fast as the hardware can. Thus, there are time delays between the samples of one AD-channel compared to the equivalent sample of another AD-channel. Also, there may be a time delay between a DA-channel output and an AD-channel input sample. That time difference also depends on the programmed, relative sequence of AD-channels and DA-channels.



Staggered acquisition is less expensive to implement than cophasic acquisition, and quite superior to the interleaved acquisition, because the time delays between the AD-channels are minimized.

Interleaved Acquisition EPC 9 using ITC-16

This is the behavior of most acquisition boards. It is also used in the EPC 9 which has an ITC-16 built-in. The individual AD- and DA-channels are sampled sequentially.



This results in time delays between the acquisition of different AD- and DA-channels. Typically, the delays are given by the sampling interval divided by the number of AD- or DA-channels.