

Application Note 131 Using the MP160/150 Averaging Mode

Overview

The ability to average physiological data in synchronization with a stimulus signal is useful for investigating a variety of physiological processes. The MP160/150 unit with *AcqKnowledge* provides considerable flexibility when performing these kinds of measurements.

The following procedure illustrates how to perform a very simple averaging sequence, known as the Auditory Brainstem Response (ABR). This test will implement the following requirements:

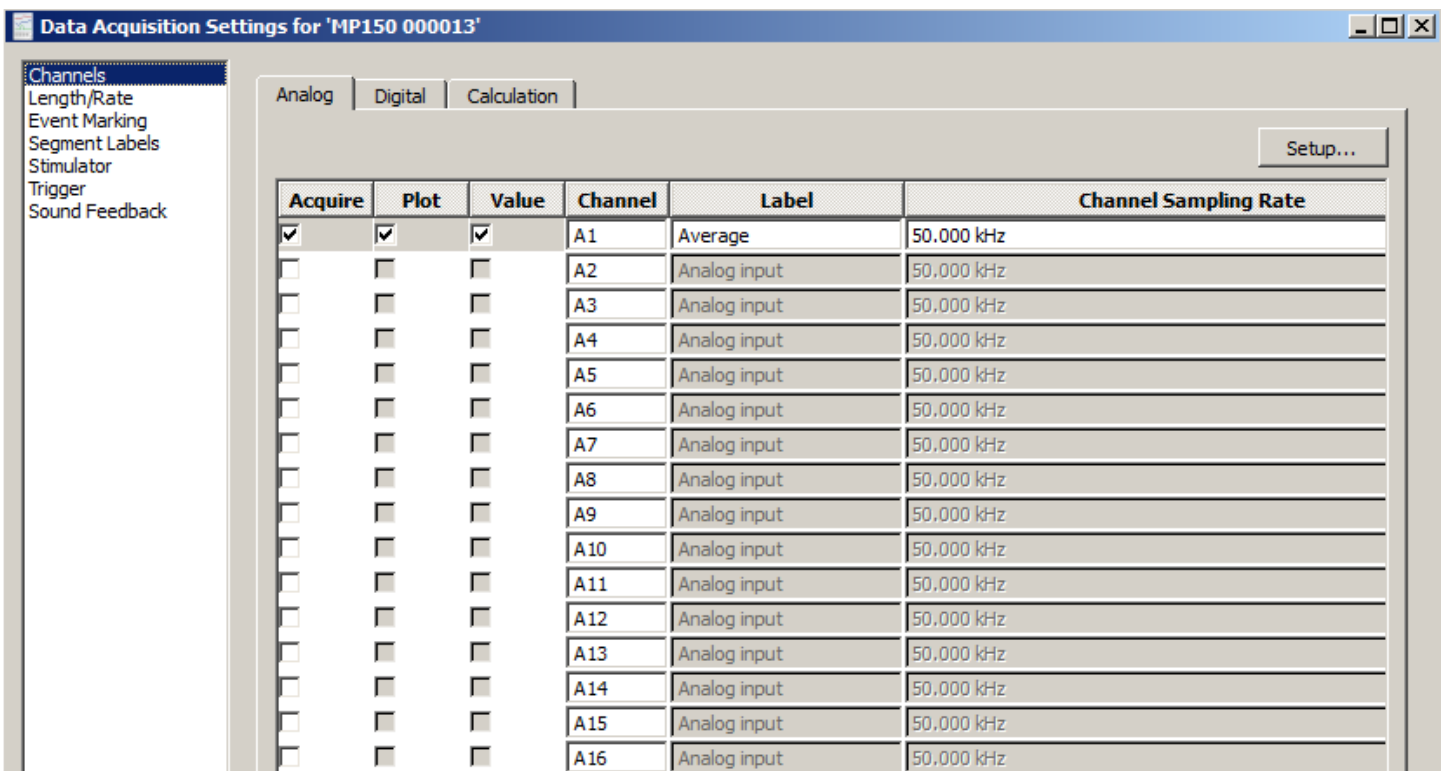
- Sample at 50,000 samples/sec on one channel
- Each averaging pass has a length of 10 msec (0.01 seconds)
- The time from pass to pass (Latency) is 90 msec
- The total number of averages is 1000
- The stimulus output pulse is 100 µsec long

The vernacular associated with averaging tests is quite colorful and varied. Be sure to define your variables correctly, prior to using the MP160/150 in the averaging mode. For example, the Latency is often confused with the Repetition Rate. The Latency is actually the inverse of the Repetition Rate. In this case, the Repetition Rate of the stimulus and averaging sequence is 11.1 Hz, which is the inverse of 90 msec.

The Latency is never less than the sum of the times of stimulus duration, acquisition length and communications overhead. The Latency is functionally equivalent to the Inter-Stimulus-Interval (ISI).

Begin by launching *AcqKnowledge* and making sure the MP160/150 hardware is powered ON and connected properly to the computer.

First start with the Channel Setup dialog, under the MP > Set Up Data Acquisition menu. Be sure to click the first row of boxes on channel A1.



Data Acquisition Settings for 'MP150 000013'

Channels

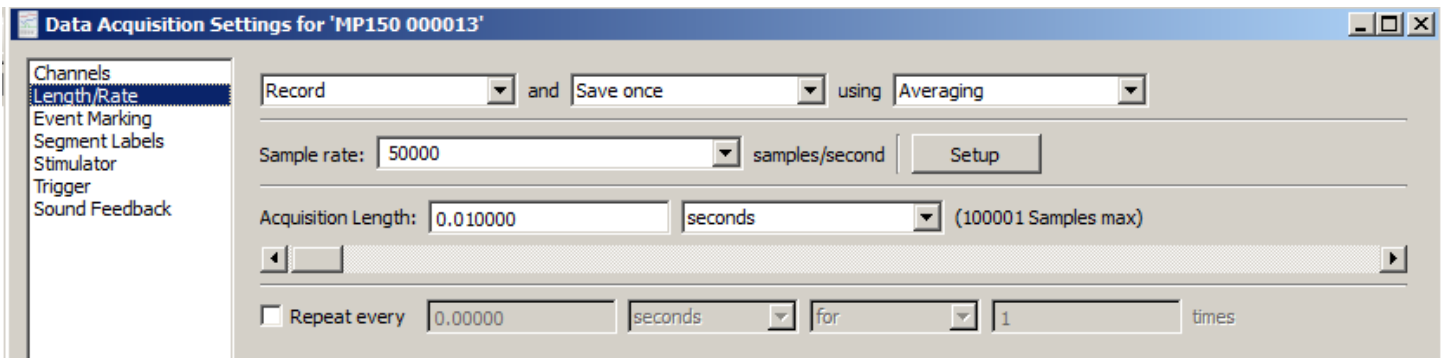
- Length/Rate
- Event Marking
- Segment Labels
- Stimulator
- Trigger
- Sound Feedback

Analog | Digital | Calculation

Setup...

Acquire	Plot	Value	Channel	Label	Channel Sampling Rate
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	A1	Average	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A2	Analog input	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A3	Analog input	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A4	Analog input	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A5	Analog input	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A6	Analog input	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A7	Analog input	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A8	Analog input	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A9	Analog input	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A10	Analog input	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A11	Analog input	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A12	Analog input	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A13	Analog input	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A14	Analog input	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A15	Analog input	50,000 kHz
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A16	Analog input	50,000 kHz

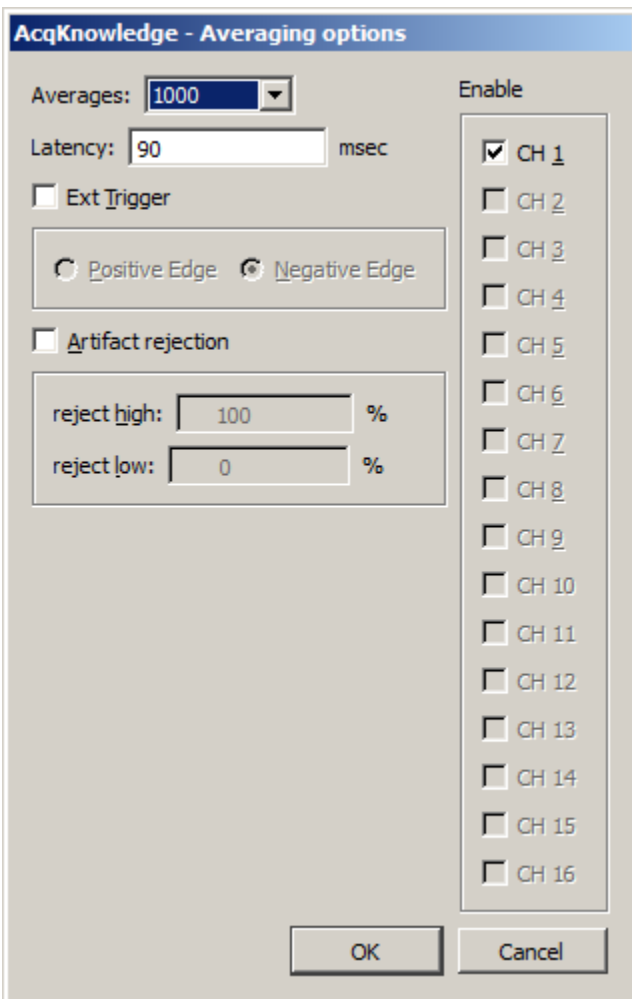
Choose Length/Rate and set the Sample rate to 50,000.



Click the Setup button and enter the following settings.

Averages: 1000

Latency: 90 msec

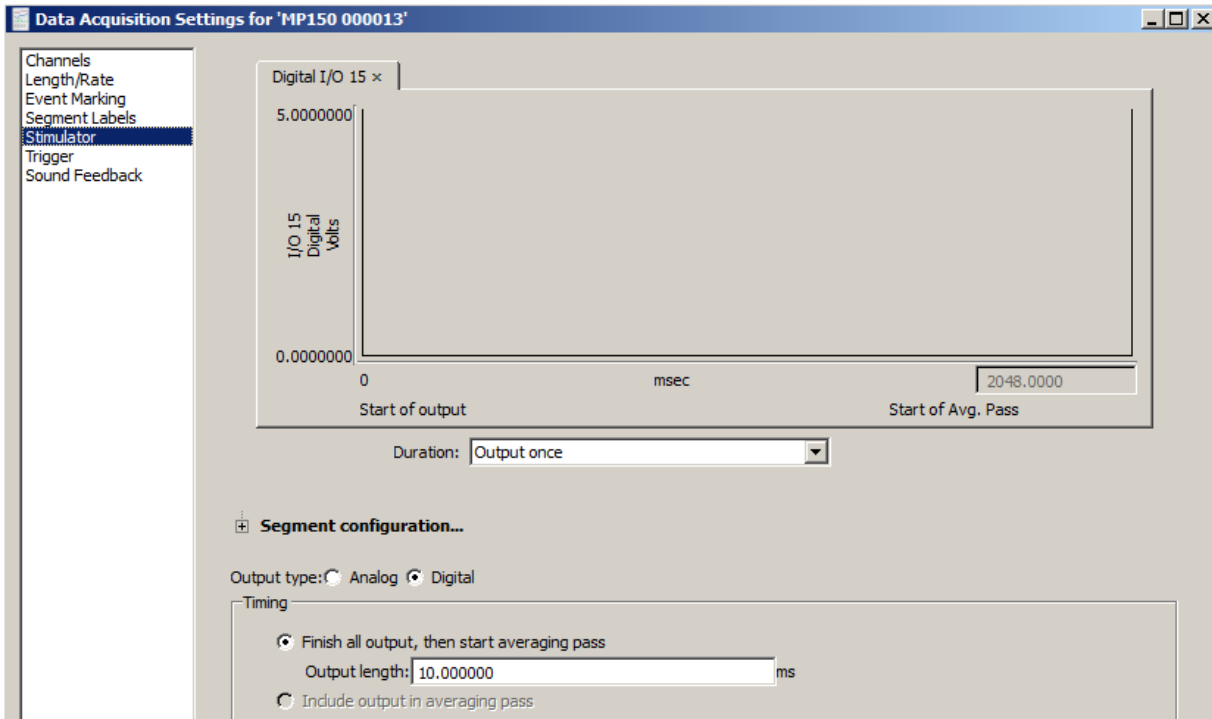


Artifact rejection is not being used in this setup. Also, because External Trigger is disabled, the MP unit will perform the averaging sequence and control the timing of each averaging pass.

Finally, prior to running the test, it's important to set up the stimulus signal. In this case, the MP160/150 will be providing the stimulus signal. The stimulus will be a 100 micro-second pulse (0.10 msec). This pulse will be output on I/O channel 15, or through the Stimulator module (STM100C).

External Stimulation

It's possible to use the MP unit in averaging in which the averaging passes are synchronized with an external stimulator. If using an External trigger, be sure to enable this option ON in the Averaging Dialog Window Setup. Also, the Latency entry will not have an impact on the averaging timing, because timing will now be controlled by an external source.



In the Stimulator setup, the Pulse (I/O 15) option is selected and the stimulus interval is set to 100 μ sec (0.10 msec). The stimulus pulse will appear on I/O 15 as a negative going pulse, which is 100 μ sec long. If a STM100C module is used, this same pulse is directed to EXT STIM output on that module to drive a set of headphones or Tube phones.

At this point, the acquisition can be started. Select the graph window and click on the Start button. The data should appear on the AcqKnowledge screen and you should see the data graph changing as a result of the averaging process.

If the data does not appear on the screen, it's probably because the graph does not have the proper scaling. In this case, stop the averaging by pressing on the Stop button and choose Display > Show All Data. This command will always fit the collected data to the screen. When the data is properly scaled, the Start button can be pressed again to begin the averaging sequence.

