

## Application Note 198: Prepulse Inhibition of Startle (PPI)

A startle response is elicited by an intense stimulus with a sudden or abrupt onset such as the slamming of a door. The function of the startle response is to interrupt or disengage an organism from ongoing activity. The human startle response involves both somatic and cardiovascular components, seen in the form of a reflexive eye-blink or a whole-body jerk.

One method that is used in startle research involves the presentation of a weak, non-startling stimulus a brief time before the startle-eliciting stimulus/ The weaker stimulus is called the a prepulse or lead stimulus. Generally, this stimulus does not elicit a startle response. However, it can inhibit the response to a startle-eliciting stimulus, known as the prepulse inhibition of a startle effect (**PPI**).

These measures can easily be exported to Excel for statistical analysis.

If presenting auditory with visual stimulus, see Application Note [214](#).

### Equipment Required

- [MP160 or MP150 System](#) (Data acquisition unit and *AcqKnowledge* software)
- [EOG100C](#) Electrooculogram amplifier
- STM100C Stimulator module
- [EL258](#) 8 mm reusable Ag-AgCl electrode (unshielded) for GND\*
- [EL258S](#) x2 8 mm reusable Ag-AgCl electrodes (shielded)
- [ADD208](#) Adhesive Collars
- [GEL100](#) Electrode gel
- [ELPAD](#) Electrode site preparation pad
- [CBL100](#) 3.5 mm Phone Plug to 3.5 mm Phone Plug cable
- [CBL122](#) 2x RJ11 to 3.5 mm jack adapters for HLT100C or AMI100D with MP160 connection
- [OUT100](#) Monaural headphones



1. Attach the STM100C between the MP150 and the UIM100C or the MP160 and the HLT100C/AMI100D.
2. Connect one end of the CBL100 to Analog Channel 1 on the UIM100C. If using the HLT100C or AMI100D with MP160, connect a CBL122 RJ11 to 3.5 mm jack adapter to each end of the CBL100. (2x CBL122 adapters required.)
3. Connect the other end of the cable to Analog Output 0 on the UIM100C (MP150) or HLT100C/AMI100D (MP160).
4. Attach the EOG100C to the right side of the UIM100C or HLT100C/AMI100D.
5. On top of the EOG100C, set the red channel selector to 2.
6. Plug one EL258S into the Vin+ and the other EL258S into Vin-.
7. Plug the EL258 into the GND connector.
8. On the STM100C, set to OUT 0, POS, DC.
9. On the EOG100C, set to GAIN 500, NORM, DC, 35LPN ON.
10. Plug the OUT100 headphones to the 50 ohm connector on the STM100C.

## Electrode Connection

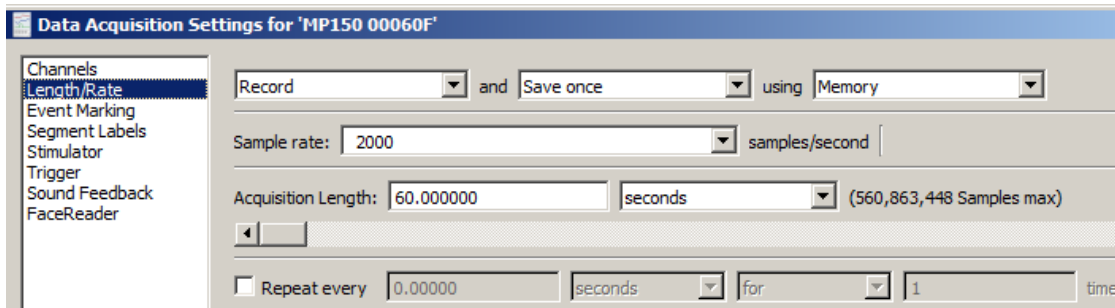
The correct placement of electrodes is essential when acquiring data. Fill the electrode cavities with GEL100 electrode gel. Attach the electrodes to the skin with ADD208 double-sided adhesive disks.

1. Place one EL258S underneath the eye.
2. Place the other EL258S on the side of the same eye.
3. Place the EL258 Ground electrode on the forehead or on the neck.

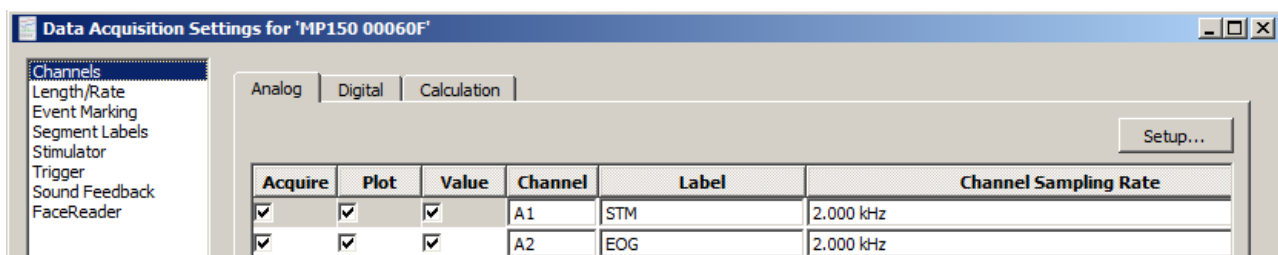


## Software Setup

1. Under **MP > Set Up Data Acquisition > Length/Rate:**
  - a. Record > Save once to Memory
  - b. Sample rate: 2000 samples/second
  - c. Length: 60 seconds



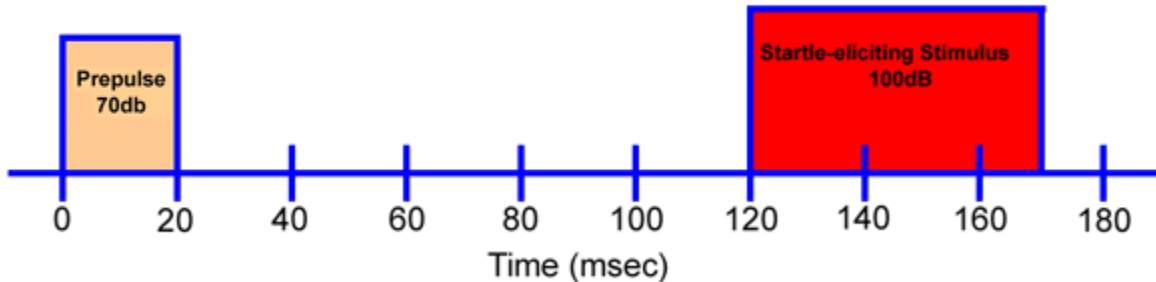
2. Under **MP > Set Up Data Acquisition > Channels:**
  - a. Select the **Analog** channel tab.
  - b. Check the **Acquire**, **Plot**, and **Value** boxes for channels **A1** and **A2**.
  - c. Label A1 "**STM**" and A2 "**EOG**."



## Procedure

In the experimental design, the prepulse lead stimulus outputs 70 dB of broadband noise and is presented for 20 msec. The startle-eliciting response includes 100 dB noise, lasting 50 msec. There should be a latency of 120 msec between the prepulse onset and the startle-eliciting stimulus onset.

### EVENT-RELATED POTENTIALS

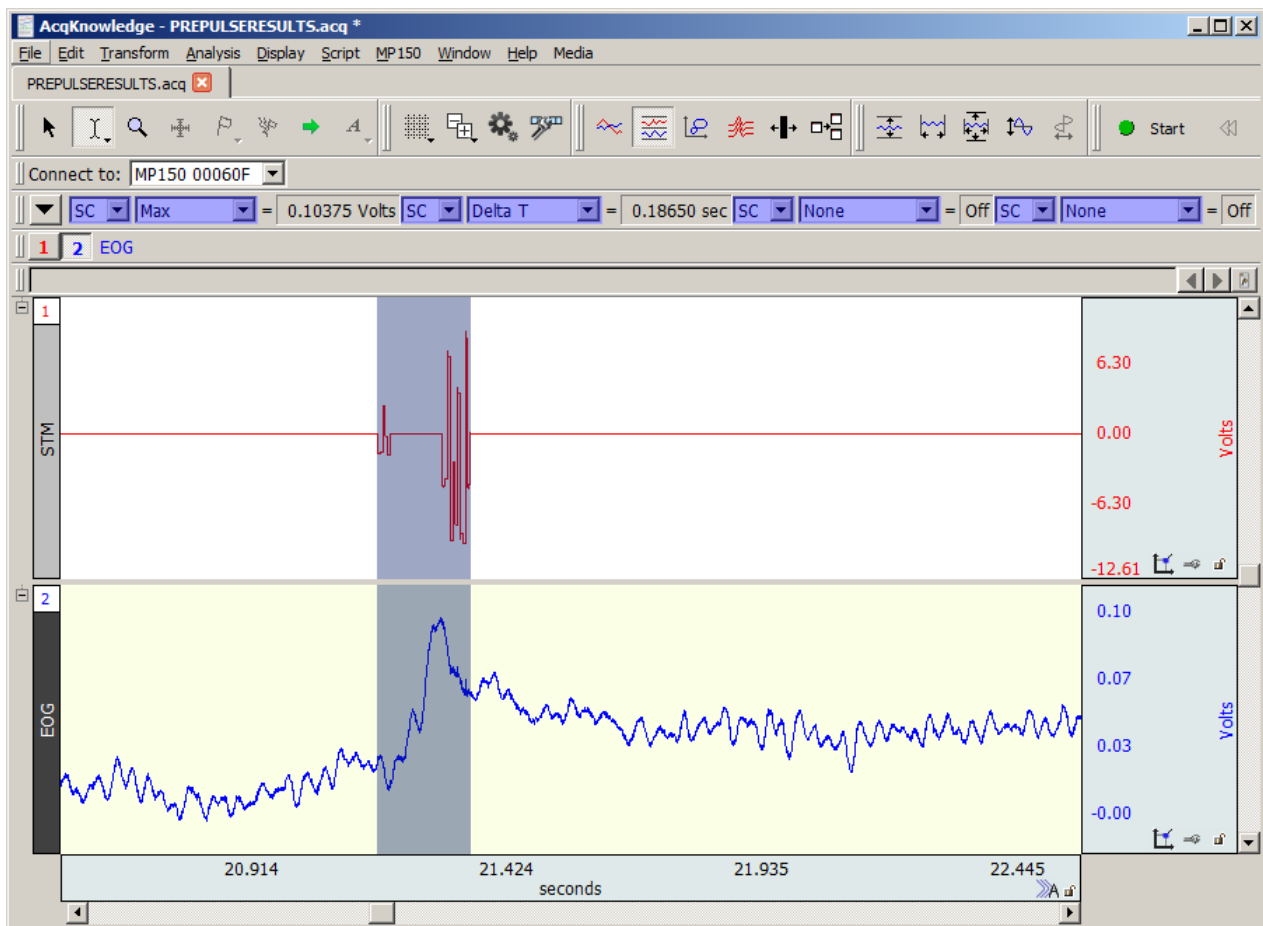


Please refer to Application Note [200](#) for detailed instructions on how to build an arbitrary waveform.

## Data Analysis

Once finished acquiring data:

1. Set a measurement box (located above the waveform window) for **Max**.
2. Use the I-beam to highlight a region where a startle-response was apparent.



Notice that the prepulse inhibits the response when a startle-eliciting stimulus is present. This is known as the Prepulse Inhibition of Startle (**PPI**)

## References

- Blumenthal, T.D. (1997). *Prepulse inhibition decreases as startle reactivity habituates*. *Psychophysiology*, 34-446-450.
- Norris, C.M. & Blumenthal, T.D. (1996). *A relationship between inhibition of the acoustic startle response and the protection of a prepulse processing*. *Psychobiology*, 24, 160-168.
- Stern, R.M., Ray, W.J., & Quigley, K.S. (2001). *Psychophysiological Recording*. 106-110. New York: Oxford University Press.