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## XID Timing Features

**XID** devices provide a built-in **Base Timer**, **Reaction Time Timer**, and a **Trial Alarm**. These timing features were implemented for the two following reasons:



- To make it possible for an application program to present visual stimuli asynchronously. A program can now present a succession of pictures or a movie while the XID device is checking for input. When a button is pressed or voice key is detected, this information is sent to the host computer **time stamped**.
- Measuring time on various computers' operating systems is not getting any easier. XID makes the task simpler by relieving the application program from timing a participant's response.

## The Base Timer

The Base Timer is always running. Typically, this timer is reset at the start of an experiment or session, and can later be queried at any time to determine how much time has elapsed.

The following commands apply to the Base Timer:

| Command            | Send Bytes | What Happens:                                                                                                                                     |
|--------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Reset Base Timer   | <b>e1</b>  | The Base Timer is reset to zero                                                                                                                   |
| Query Elapsed Time | <b>e3</b>  | The XID device sends back <b>e3</b> followed by four bytes indicating the number of milliseconds that have elapsed since the Base Timer was reset |

## The Reaction Time Timer

The Reaction Time Timer is also always running but works differently from the Base Timer. Typically, this timer is reset at the onset of a trial. The application then continues to do more work or simply waits for the XID device to respond. When the XID device detects input from the participant, it sends that information to the host computer time stamped with the participant's reaction time.

| Command                   | Send Bytes | What Happens:                            |
|---------------------------|------------|------------------------------------------|
| Reset Reaction Time Timer | <b>e5</b>  | The Reaction Time Timer is reset to zero |

## The Trial Alarm

There are instances when a researcher needs to present trials at exact fixed intervals, e.g. when using an fMRI scanner. XID devices address this requirement by providing a Trial Alarm. The application program sets the alarm's period and the XID device responds by sending bytes **TA** at the specified interval until the Trial Alarm is stopped.

| Command                | Send Bytes        | What Happens:                                                                                            |
|------------------------|-------------------|----------------------------------------------------------------------------------------------------------|
| Start Trial Alarm      | <b>e2 + value</b> | The Trial Alarm is started. 'value' is the alarm's period in milliseconds, expressed as a binary number. |
| Stop Trial Alarm       | <b>e20000</b>     | The Trial Alarm is stopped                                                                               |
| Get Trial Alarm Period | <b>_e2</b>        | Returns <b>_e2</b> followed by the current Trial Alarm period                                            |